American Machinist

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

JANUARY 5, 1953

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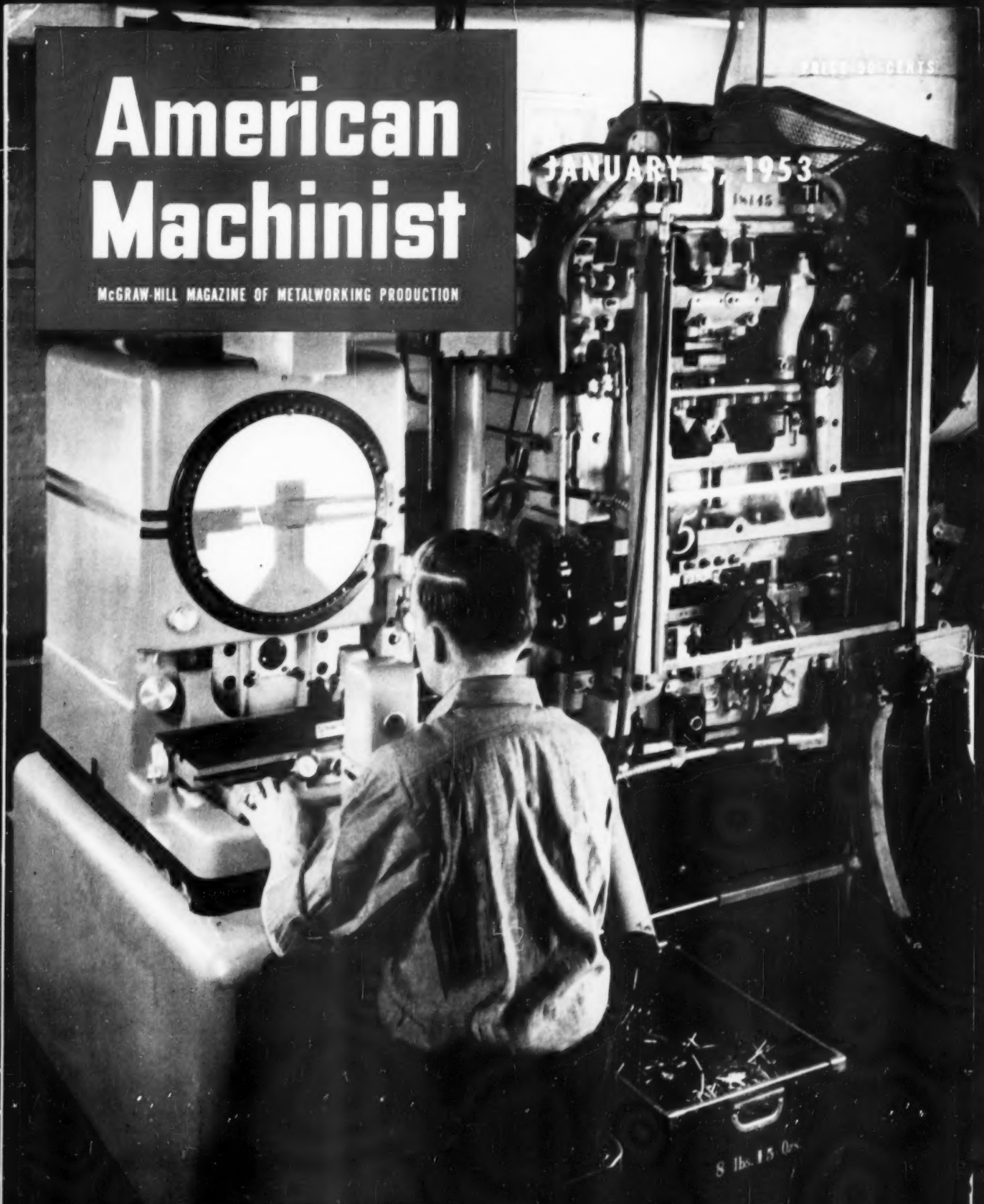


Optical Inspection in Production—see page 2

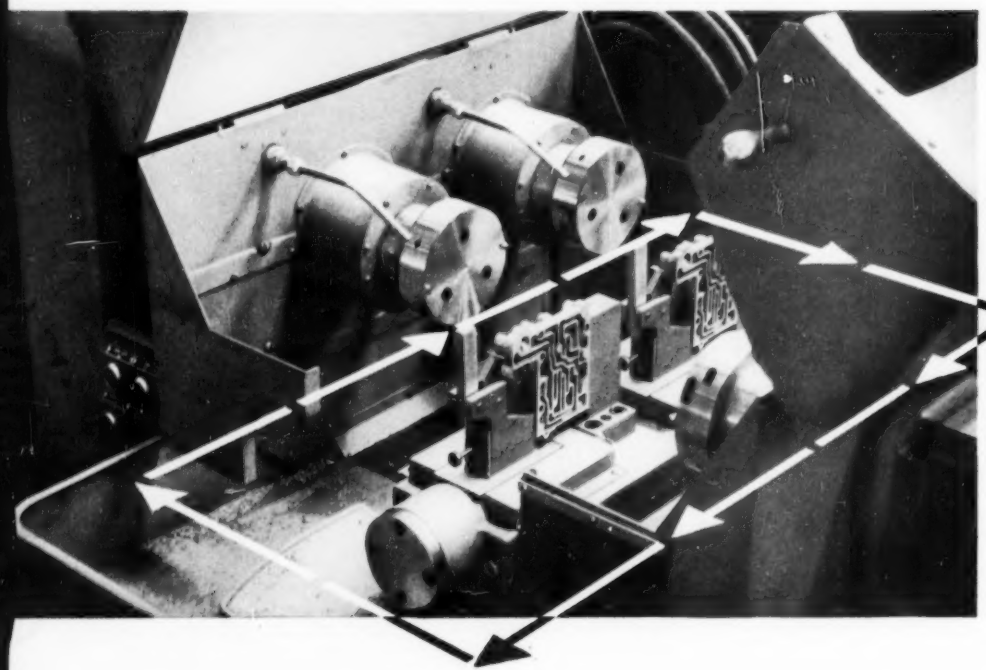
Optical Gaging Comes Out of the Toolroom—A SPECIAL REPORT

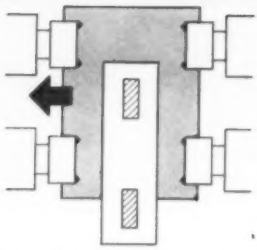
don't miss: UNSKILLED OPERATORS SET UP THEIR OWN MACHINES
TARGET FIXTURES PRECISION-WELD NEW GUN PEDESTAL

Heald Bore-Matic speeds

FLY-CUTTING

. . . gives extra precision, too





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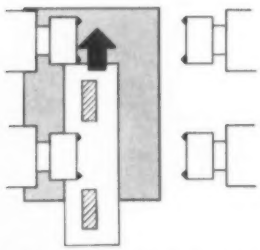

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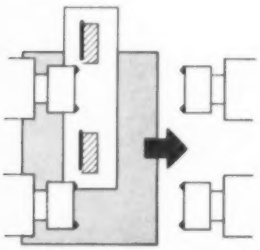

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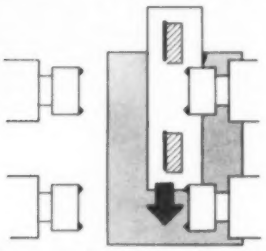

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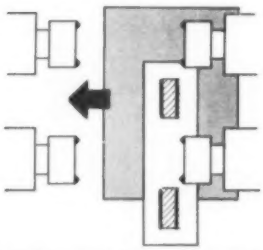

5. Table rapid traverses left to unloading position.

Valve bodies fly-cut on both sides, two parts at a time, in fully automatic high-speed cycle

● Many people think of a Heald Bore-Matic only in terms of the conventional boring, facing, turning and chamfering operations. Yet these versatile machines can be equally well applied to a wide variety of other operations — take fly-cutting for example.

Here a model 222 Heald Bore-Matic combines fast automatic cycling with characteristic high precision. Two valve bodies are fly-cut simultaneously as they are indexed past the rotating quills with double tools mounted in the face. The machine is fully automatic, finishing both sides of two parts in a single machine cycle.

Remember — when it comes to precision finishing, it pays to come to Heald.

HEALD

Case Study
No. 2232-96 in
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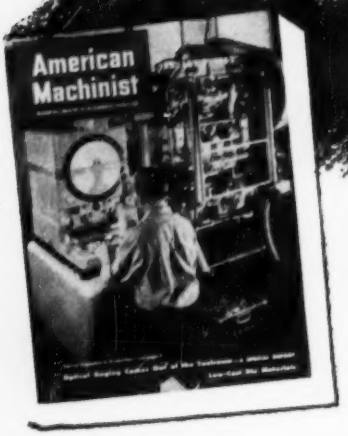


Clips & Quips

Optics In the Shop . . . Our cover shows an optical projector in the press shop at Eastman Kodak's Camera Works, checking blanked parts as they come off the press. This is typical of the increasing application of optical gaging on production lines, and serves to introduce our Special Report in this issue. The Report covers principles and actual installations in plants of instrument, business-machine, and cutting-tool manufacturers. It is the result of an idea of Associate Editor DeGroat, and a series of junkets to the plants concerned, as well as those of makers of optical units.

Rubber Stamp . . . Late in November one of our editors was in Dallas—that's in Texas, suh!—and visited the plant of Temco Aircraft Corp. Shop men there were excited over a new way of scheduling jobs on turret lathes and millers, arranged so almost any operator can do his own setting up, with no time lost. Yet, skilled men are in control of each step. In an era when more and more plants are trying to get specialists to make all setups, this was news! What's more, the heart of the idea is a batch of home-made rubber stamps. So we asked the originator to tell us all about it. You'll find his explanation as our lead article—including how to make your own stamps from tire patches, with patterns.

Tooling . . . given in one story in this issue are some of the answers to a difficult tooling problem, that of making rocket nose-pieces by cold extrusion. These answers are from Pontiac, where they should know . . .

Welding Finish-Machined Parts . . . Watertown Arsenal faced the job of making the pedestal for the new Army *Skysweeper* anti-aircraft gun—and some spots very tough to reach to machine after the pedestal was welded up. The solution was to machine those spots first, then weld, holding the pieces in targeting fixtures so they're within plus or minus 0.010 in. when finished. We've got the story in this issue—and it also tells about bringing portable machine tools to machine that pedestal, several machines working at once, set up on a huge grid. Eliminates the wait for special machines and gives flexibility.

Reprints . . . Our Reader Service Dept handed us a set of interesting statistics the other day. Orders for special reprints of articles in the first 11 months were up 50% over last year, which in itself was very good. And the total number of copies in the orders was likewise well over 1951, although the average number of copies per order was down. That last we particularly like—it means that more people are interested in more articles. Requests for individual copies and tearsheets likewise are up—another indication that the articles are useful to more people.

Throatless Press . . . For several months now, we've been bursting with the story on a radically new press idea—the monolithic throatless. It's *very* interesting—and here, at last, are the details. First announcement was in our 75th Anniversary Issue; here is the description, just released, of the details and the companies back of it.

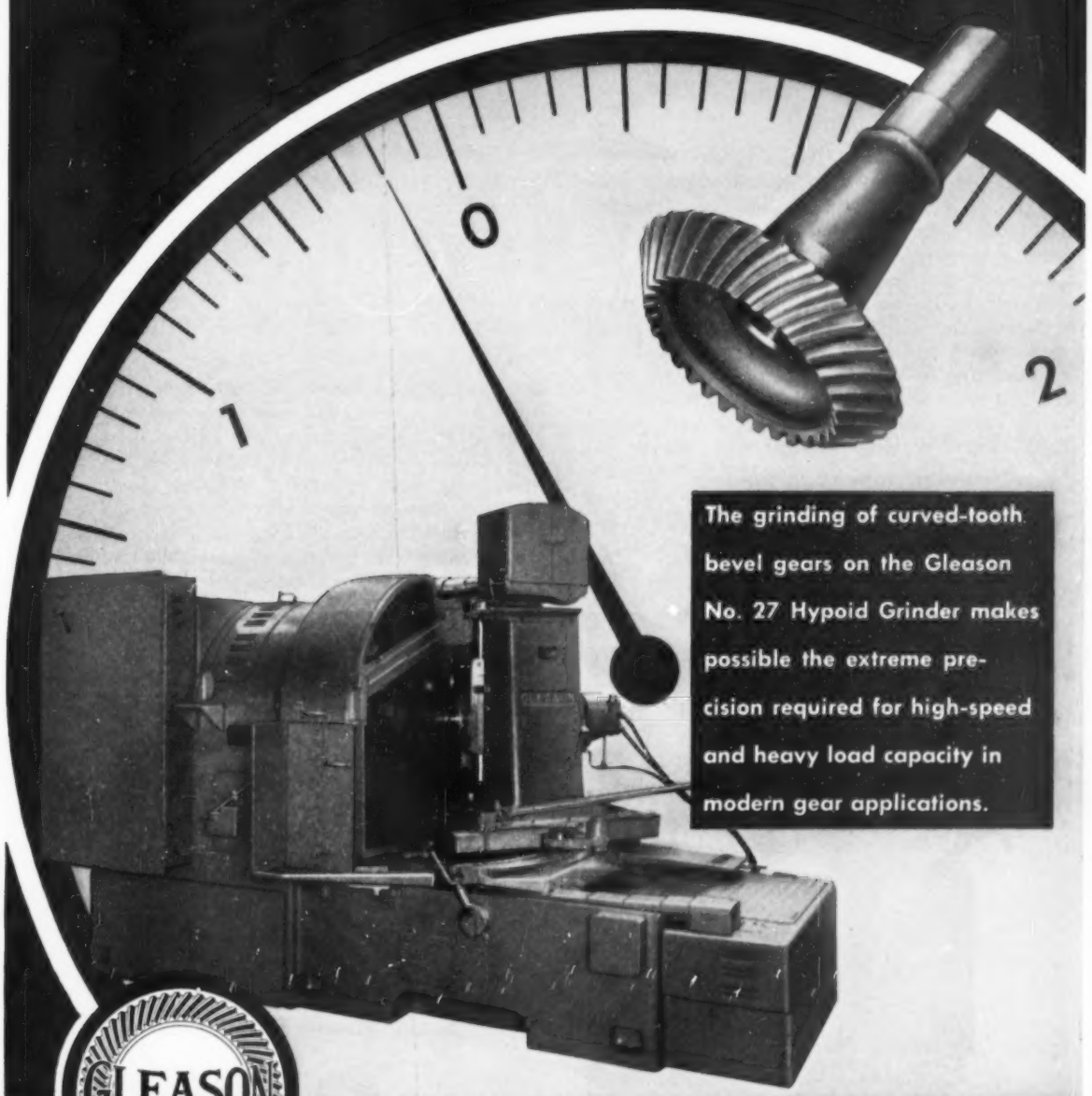
For Bosses . . . We've got a pair of articles that give executives something to think about. One covers that taboo subject, the alcoholic employee. Firing is *not* the answer, even though it's the traditional escape. Here is authoritative information, from Alcoholics Anonymous . . . In sharp contrast, we tell how the new unified standard threads affect present US gaging equipment.

Coming . . . *AM* for Jan 19 is your 1953 Production Preview—the big issue that classifies and summarizes all items describing new equipment, parts and materials published during 1952. The total will be something more than 1400 items, up more than 200 over last year. There'll also be our annual statistical survey and forecast—a working handbook for you all during 1953.

IDEA FISHERMAN . . . Paris F. (Curly) Young was born near Tyler, Okla., in 1919, and entered in machine-shop work at high school there. (He spent half of each day in classroom work, half in machine shop during his junior and senior years.) He was graduated in 1937 and immediately accepted a full-time job with the Southwest Supply Co. In 1941, he got married—and joined the Texas Division of North American Aviation, Inc., Dallas, as production operator, later rising to general foreman. He remained there until that division was closed in 1945, when he joined Temco Aircraft Corporation (then Texas Engr & Mfg Co, Inc) as foreman, when that company began operations in the North American "A" plant. He has advanced to general foreman of machine superintendent.

Mr Young developed a new way of scheduling setups on turret lathes and millers, which he describes in our lead article. To balance his many interests, he's a fisherman from way back.

GRINDING ACCURACY



The grinding of curved-tooth bevel gears on the Gleason No. 27 Hypoid Grinder makes possible the extreme precision required for high-speed and heavy load capacity in modern gear applications.

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Grinding Carbon Rods

an unusual centerless job

with the usual CINCINNATI advantages

Unusual applications are becoming more commonplace for the versatile CINCINNATI FILMATIC No. 2 Centerless Grinder. To mention a few: glass syringe plungers, billiard balls, cast iron tensile test specimens, pen and pencil parts, torsion bars, fishing reel spindles and a wide variety of defense items. And now carbon rods are rough ground from square to round in one pass, at a thrufeed rate of 20 feet per minute. Then a finish grinding operation on a No. 2 Centerless produces accurate roundness and sizing within .0005". Small diameter carbon rods, below ½", are usually ground in three or four passes. ¶ Shops that discard old grinding methods and assign their work to CINCINNATI FILMATIC Centerless Grinders can count on these advantages:

a) Little or no down time, because of FILMATIC grinding wheel spindle bearings and other features of sound engineering.

b) Simple changing of wheels and work rest blades.

c) Close limits of accuracy, promoted by rugged construction and sensitive slide adjustment.

d) Simple, easy to operate.

You may not be interested in grinding carbon rods, but you can't overlook the advantages of low-cost precision grinding offered by CINCINNATI FILMATIC No. 2 Centerless Grinders. ¶ Why not re-examine your cylindrical grinding operations with the idea of improving results through the centerless method of grinding. Catalog No. G-611 gives you complete details of these reliable, low-cost producers.

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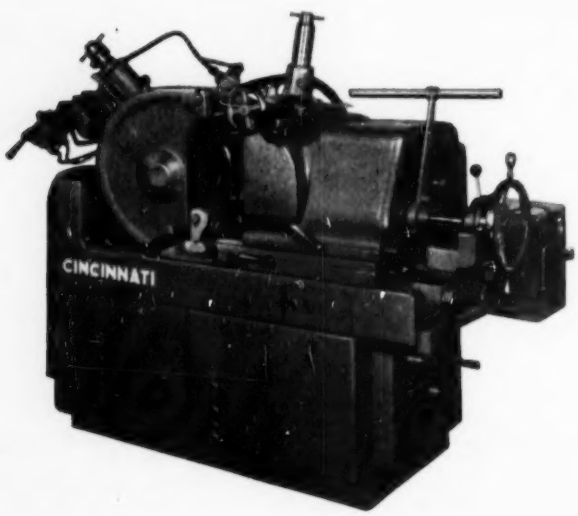

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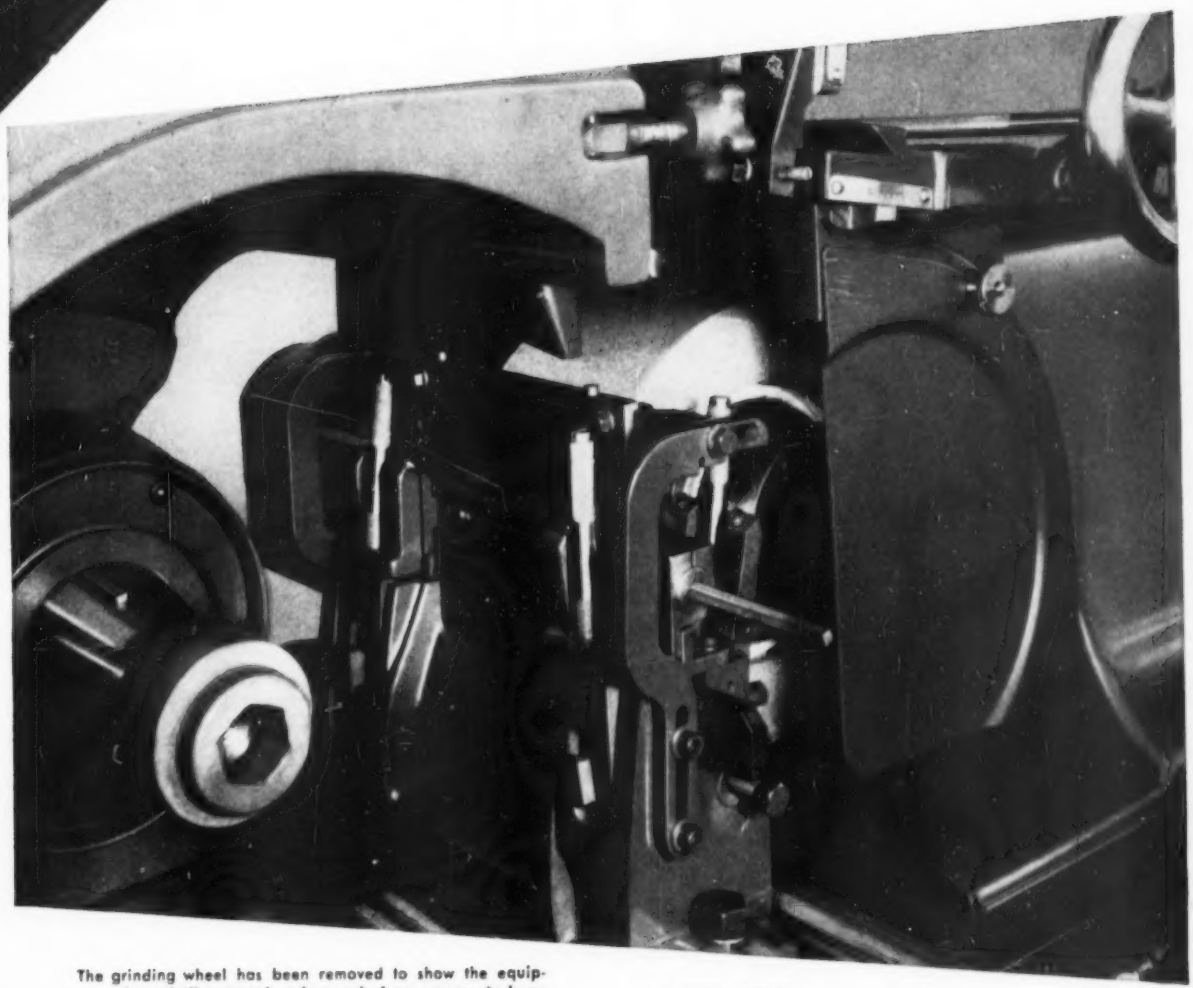

The grinding wheel has been removed to show the equipment for grinding round carbon rods from square stock, on a CINCINNATI FILMATIC No. 2 Centerless Grinder. This setup is applicable to grinding other materials having the approximate consistency of carbon rods.

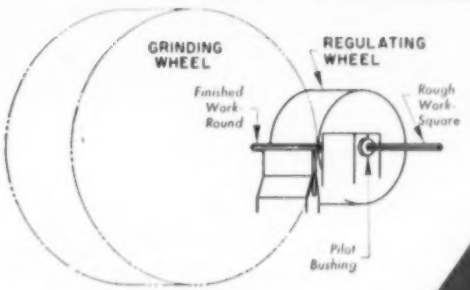

Diagram showing principle of operation, grinding round carbon rods from square stock, on a CINCINNATI FILMATIC No. 2 Centerless Grinder.

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CENTERTYPE GRINDING MACHINES • CENTERLESS GRINDING MACHINES
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Grinding Carbon Rods

an unusual centerless job

with the usual CINCINNATI advantages

Unusual applications are becoming more commonplace for the versatile CINCINNATI FILMATIC No. 2 Centerless Grinder. To mention a few: glass syringe plungers, billiard balls, cast iron tensile test specimens, pen and pencil parts, torsion bars, fishing reel spindles and a wide variety of defense items. And now carbon rods are rough ground from square to round in one pass, at a thrufeed rate of 20 feet per minute. Then a finish grinding operation on a No. 2 Centerless produces accurate roundness and sizing within .0005". Small diameter carbon rods, below ½", are usually ground in three or four passes. ¶ Shops that discard old grinding methods and assign their work to CINCINNATI FILMATIC Centerless Grinders can count on these advantages:

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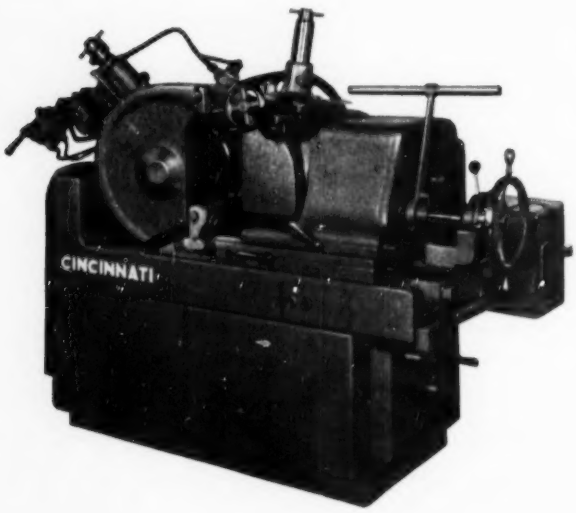

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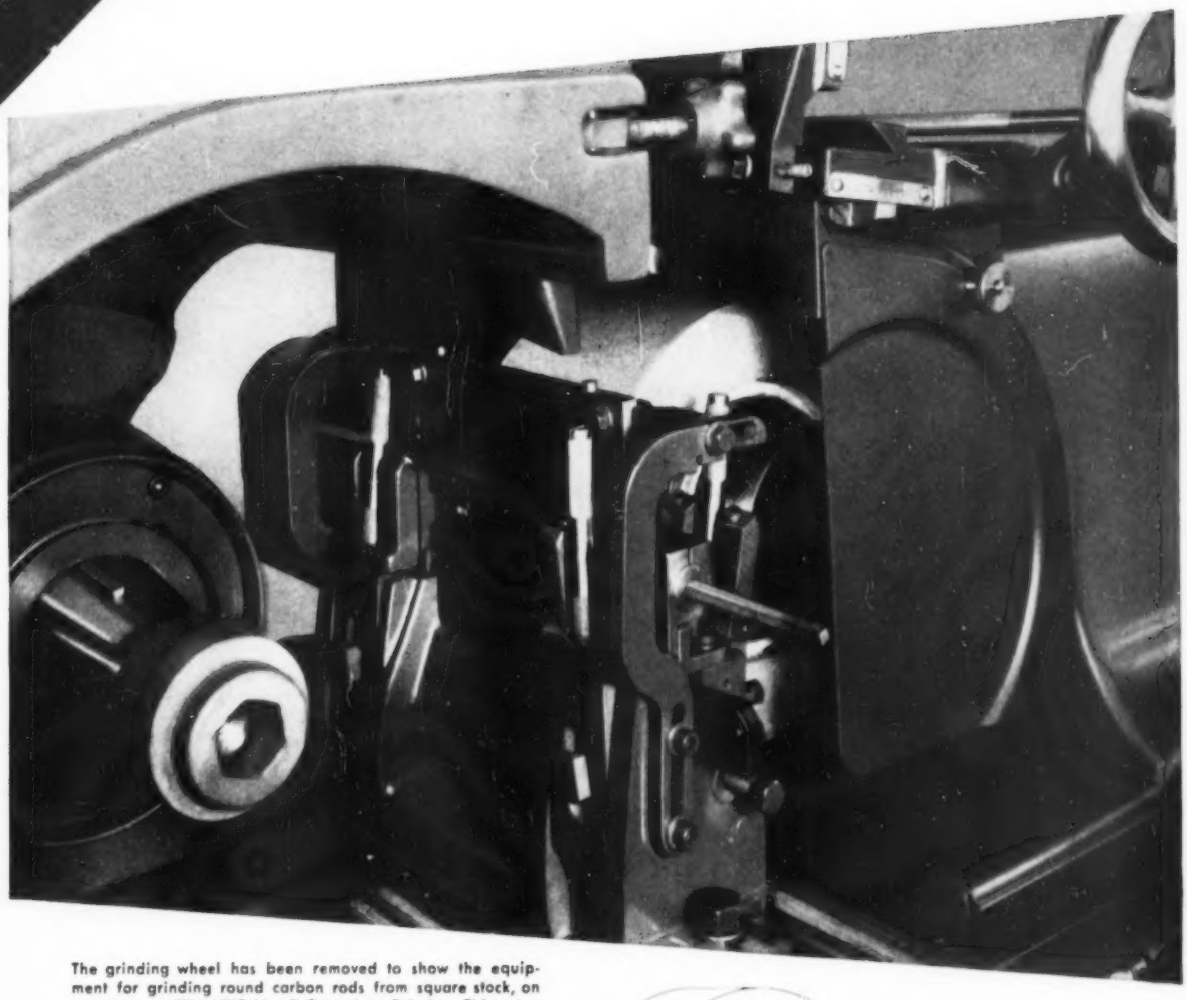

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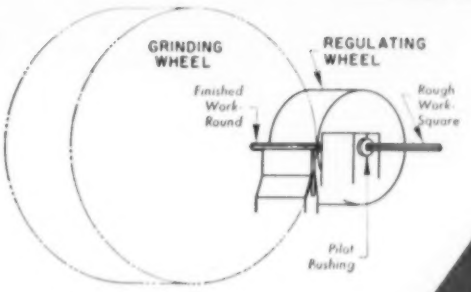

Diagram showing principle of operation, grinding round carbon rods from square stock, on a CINCINNATI FILMATIC No. 2 Centerless Grinder.

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CENTERLESS LAPPING MACHINES • MICRO-CENTRIC GRINDING MACHINES

TO TURN A TANK TURRET...

Fellows 120"

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SHAVING MACHINES
THREAD GENERATORS
CUTTERS AND SHAVING TOOLS
GEAR INSPECTION INSTRUMENTS

PLASTICS MOLDING MACHINES

Cuts a Giant Gear

At the Chrysler Delaware Tank Plant, tank turret gears are accurately finish-cut with six Fellows 120″ Gear Shapers.

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For intermediate, or larger gears, the speed and precision of the Fellows 36-Type, 48-Inch, or 100-Inch Gear Shapers may be the answer to your gearing problems. To learn how, write or call the Fellows office nearest you.

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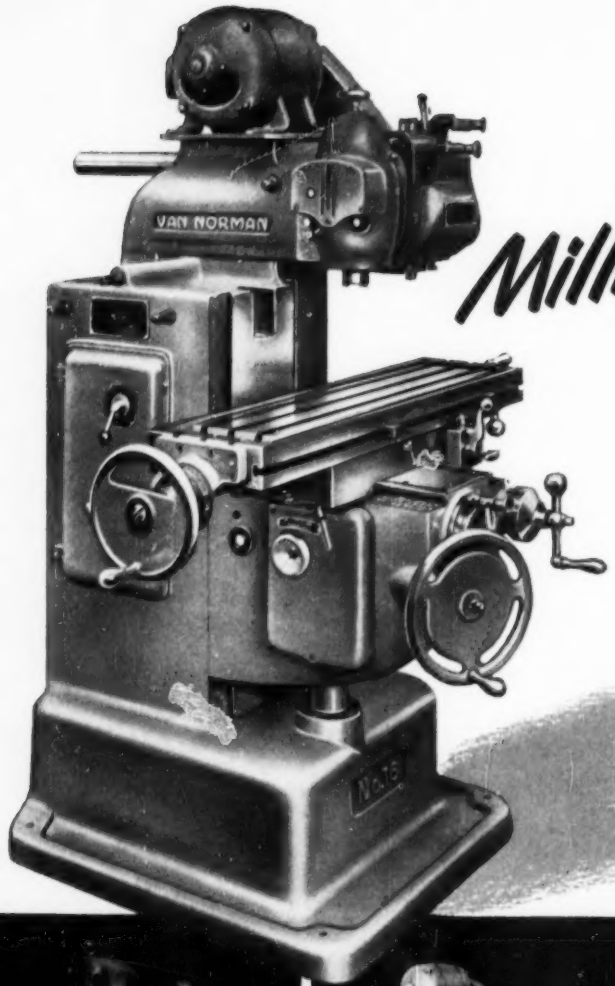
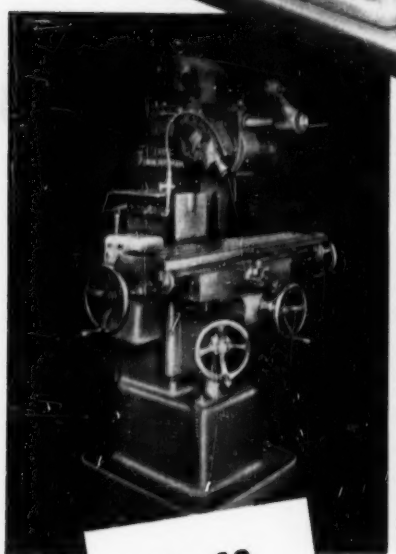


Milling Production Simplified



No. 12
Table: 37½" x 9¼"
Cutterhead in
Angular Position

No. 16
Table: 37" x 9½"
Cutterhead in
Horizontal Position

No. 22L
Table: 45" x 10"
Cutterhead in
Vertical Position

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VAN NORMAN

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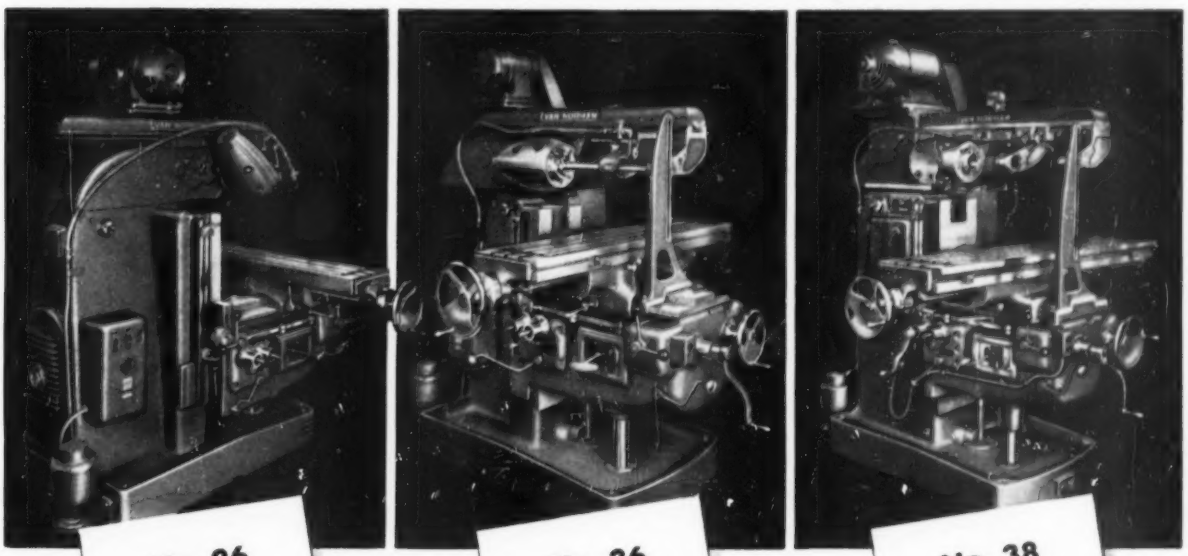
Equip your toolroom and production lines with modern Van Norman Ram-Type Millers that provide new ease of set-up and control . . . smoothness in operation on the heaviest of cuts . . . and plenty of weight and power to keep on turning out work of highest accuracy under the strenuous schedules that today's conditions impose.

Featuring the adjustable cutterhead and movable ram, these Millers enable the operator to go from vertical to angular to horizontal milling with a minimum of resetting of work and with standard arbors and cutters. Operation is simplified because the controls are placed right at the operator's fingertips. Rigidity to maintain accuracy on the heaviest cut is assured by the balanced design of each machine.

All these features sum up to the highest output, fewest errors, lowest milling cost and machine maintenance. Find out how Van Norman Ram-Type Millers can save on your work. Write for catalogue.



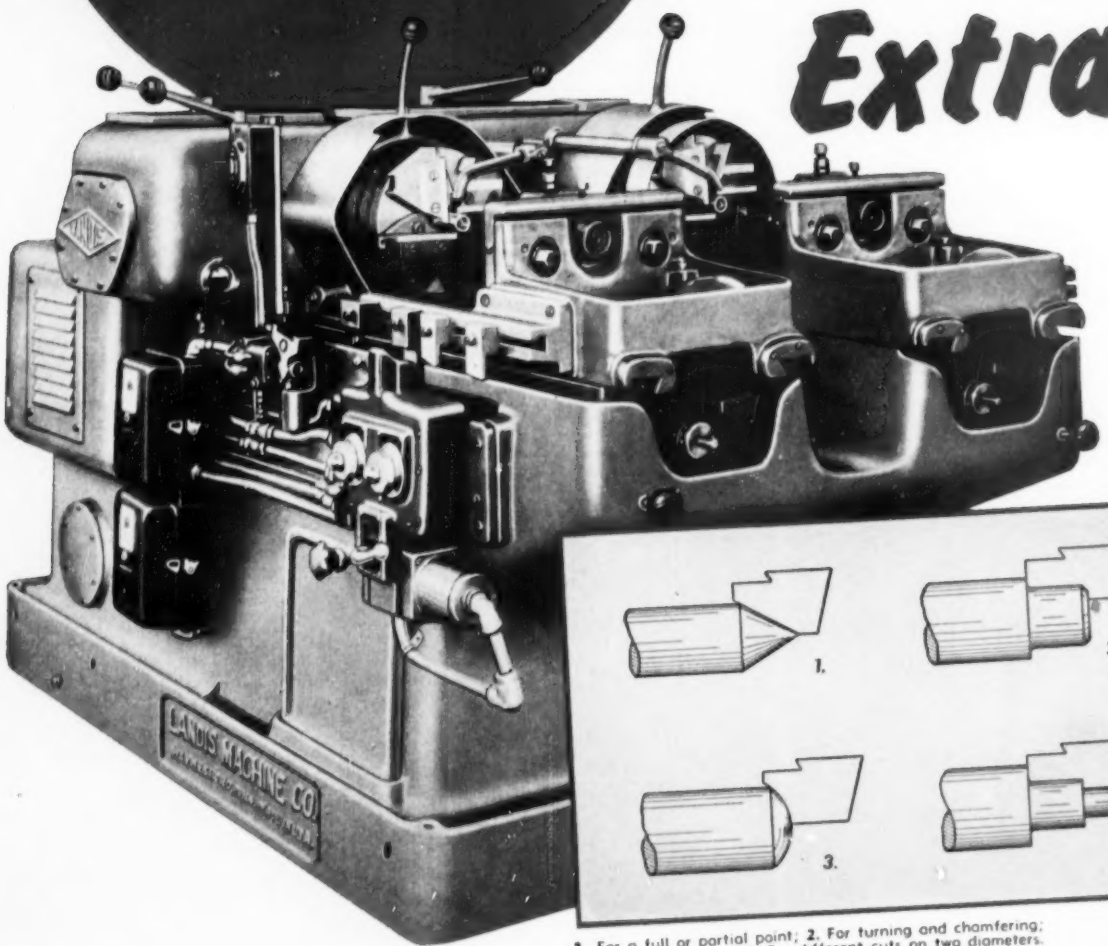
No. 26
Table: 58" x 13"
Cutterhead in
Angular Position

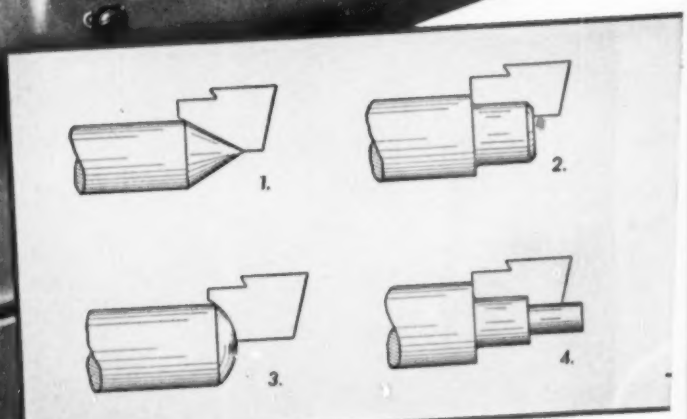
No. 36
Table: 64" x 14"
Cutterhead in
Horizontal Position

No. 38
Table: 64" x 14"
Cutterhead in
Horizontal Position

COMPANY, SPRINGFIELD, MASSACHUSETTS, U. S. A.

Hollow Extra





1. For a full or partial point; 2. For turning and chamfering; 3. For a radius form; 4. For different cuts on two diameters.

THE WORLD'S LARGEST EXCLUSIVE MANUFACTURERS OF THREAD GENERATING EQUIPMENT

Milling

LANDIS Feature

LANDIS Die Heads, in addition to conventional threading operations, can be equipped with LANDIS Turning Cutters which will perform turning, grooving, forming, and facing by the hollow milling method. Milling operations may be performed by LANDIS Heads applied to automatic screw machines, turret lathes, or LANDIS leadscrew-type or hydraulic-feed threading machines, and other positive-feed-type machines.

Many Production Advantages

Hollow milling by this method offers an increased efficiency occasioned by the application of a multiple number of cutting tools. The feed rate is thus approximately equal to that of a single tool, multiplied by the number of simultaneously-functioning cutters in the unit—four or six for LANDIS Heads.

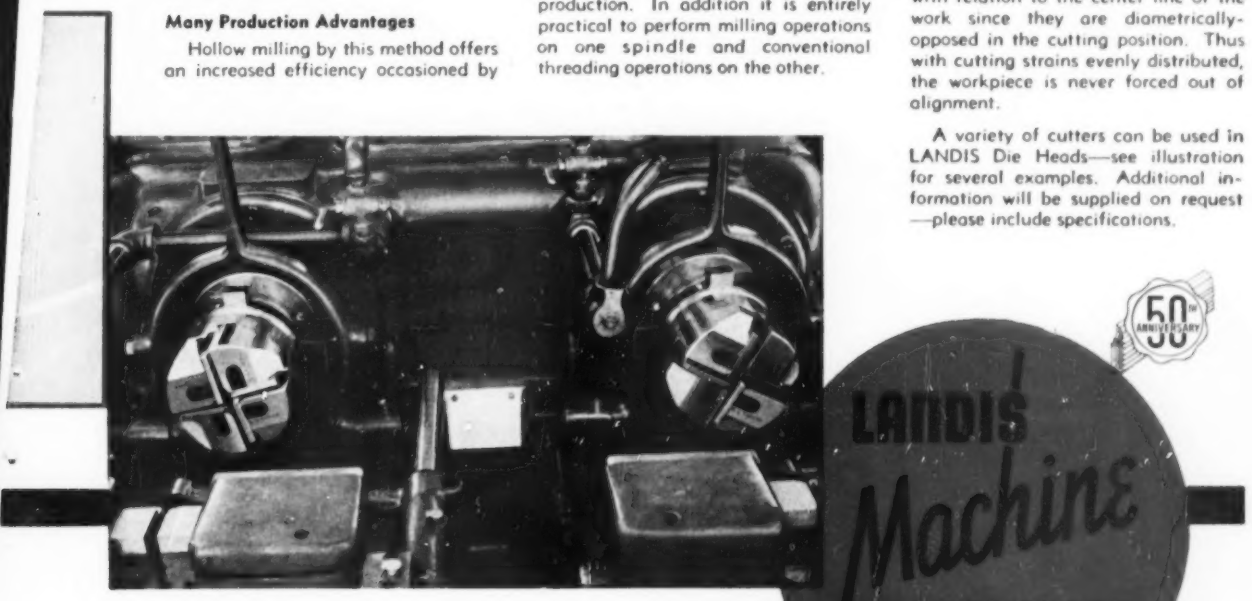
The LANDMACO Double Head Leadscrew Threading Machine affords a particularly efficient hollow milling method. One carriage will perform the milling operation while the other carriage is being loaded by the operator, thus allowing consistent continuous production. In addition it is entirely practical to perform milling operations on one spindle and conventional threading operations on the other.

LANDIS Turning Cutters

LANDIS Cutters are economical tools for they are usable for most of their original length. Only the rake angle needs regrinding—a quick and simple procedure. One set of cutters will machine a wide diametrical range of work, and cutting speeds will range from 30 to 70 linear feet per minute.

Wear and breakage of tools and spoiled work is held to a minimum. The cutting edges of the cutters can be precisely and uniformly located with relation to the center line of the work since they are diametrically-opposed in the cutting position. Thus with cutting strains evenly distributed, the workpiece is never forced out of alignment.

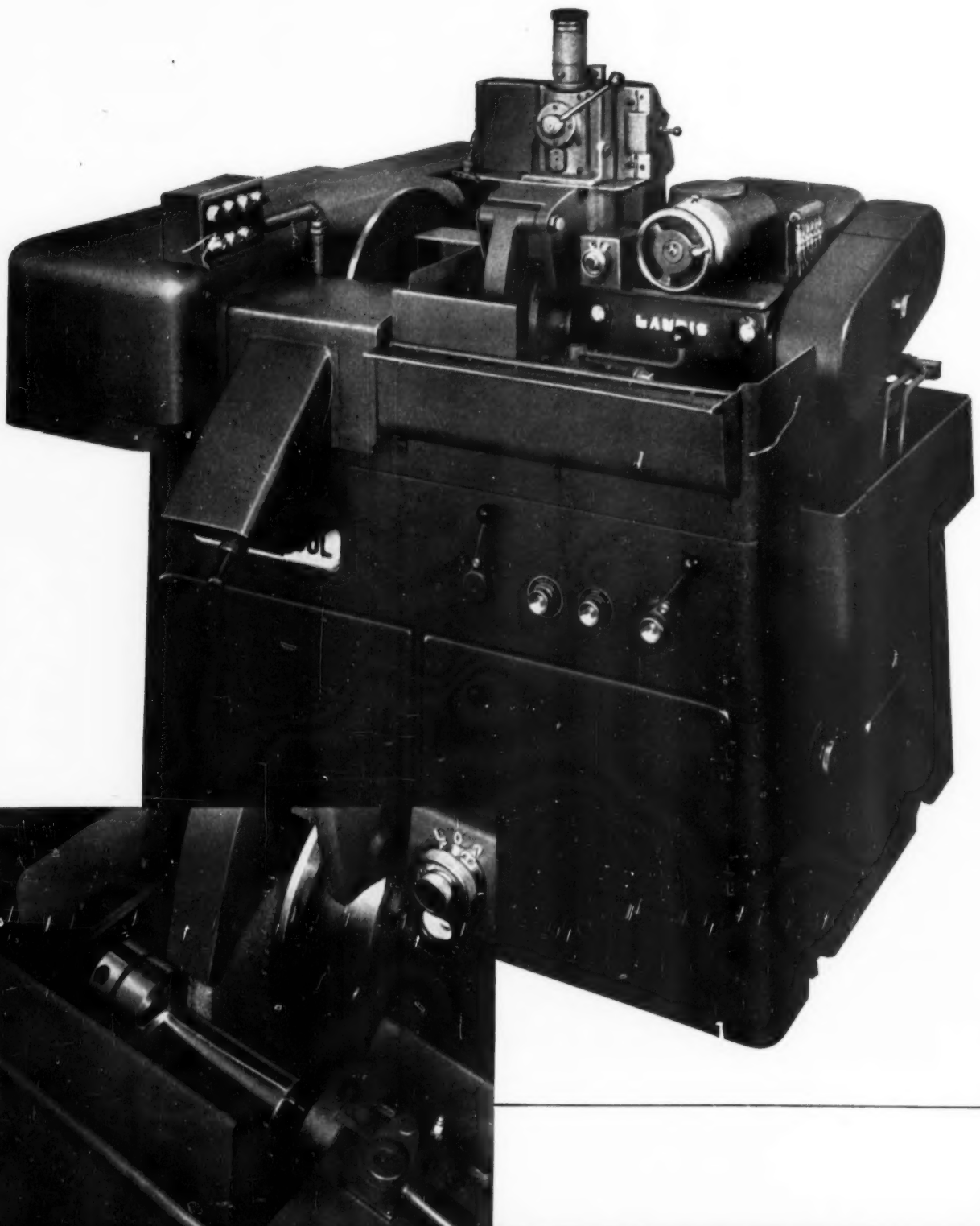
A variety of cutters can be used in LANDIS Die Heads—see illustration for several examples. Additional information will be supplied on request —please include specifications.



50th ANNIVERSARY

LANDIS Machine COMPANY
WAYNESBORO PA., U.S.A.

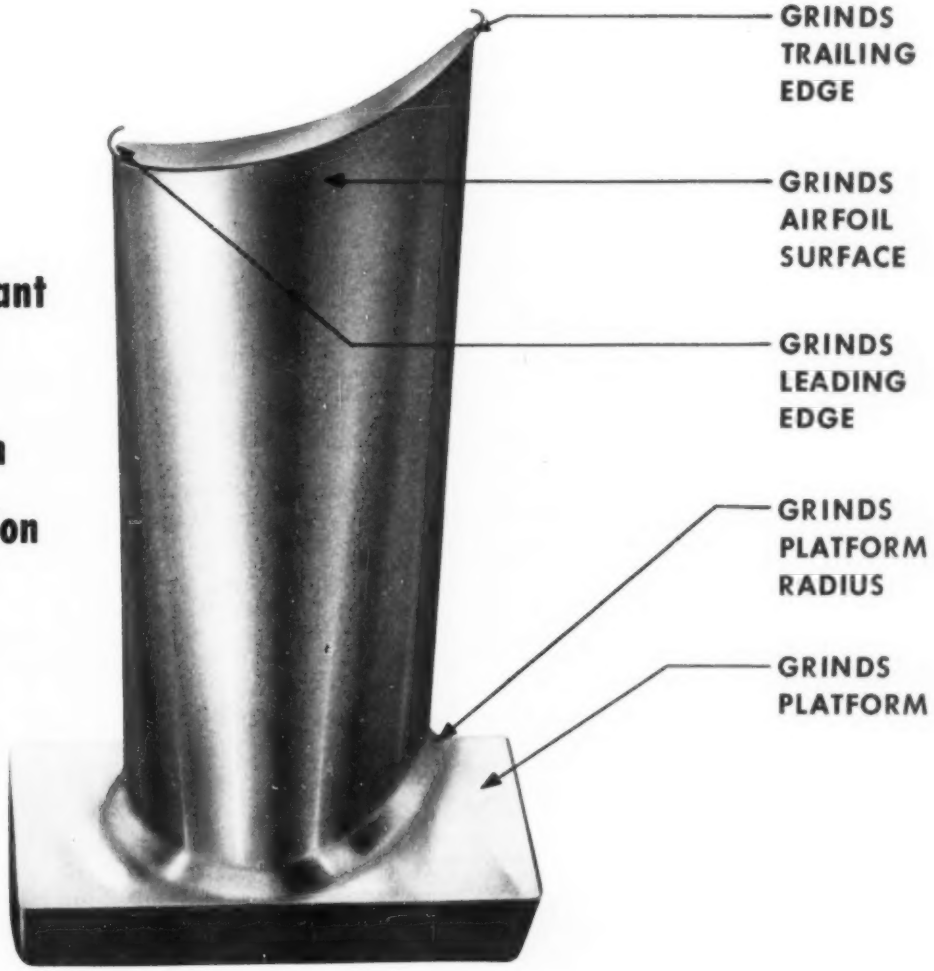
NEW LANDIS



jet blade contour grinder

Grinds from forging to finished blade

5 important surfaces ground in 1 operation



This is the fastest known method for grinding blades, buckets, vanes and nozzles now being used in jet engines. You can grind pieces with twisted, warped or broken-back contours; straight contours; parallel or non-parallel sides.

LANDIS TOOL CO. · WAYNESBORO, PA.

153

LANDIS

precision grinders

How to reduce out-of-line when machining outsize

Increased work capacity of G&L 50 Series Horizontal Bar with new underarm support slashes handling, setup and job time on these difficult 100-ton steel castings

OPEN construction plus the new underarm arrangement of the G&L 50 Series Horizontal Boring, Drilling and Milling machine has greatly simplified the job of machining these huge rolling mill housings.

High accuracy as far as 60" from headstock

This new development permits many milling, facing and boring operations in one setup . . . at right angles to the spindle . . . as far as 60" from the headstock. An offset milling head can be mounted on the support to reach limited-access surfaces. And flatness and parallelism of all milled surfaces are held to close limits.

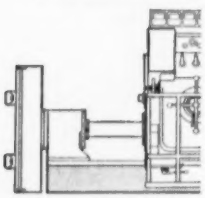
For example: With the housing set on its side (see photo) it's possible to mill and bore the inner window surfaces . . . in fact the complete "window" in one setup. When the operation shown is completed, the operator merely rotates the angular milling attachment to mill the upper angular surfaces. The machine spindle drives the cutter through gears in both the anti-friction bearing support block and the milling head.

Cross feed is accomplished through synchronized movement of the underarm and spindle. Longitudinal feed movement of the machine column on its runway is used to mill the upper and lower side sections of the window.

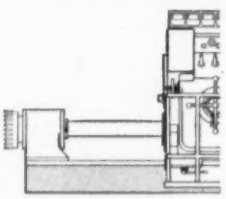
Do you need extra capacity?

This new underarm support is available on all new G&L 50 Series Floor type machines (6" or 7"). If you'd like to know how you can keep handling, setup and labor costs in line when working with huge castings, contact your nearest G&L representative or write direct. BUT DON'T DELAY . . . DELIVERY ON G&L MACHINES MAY BE BETTER THAN YOU THINK.

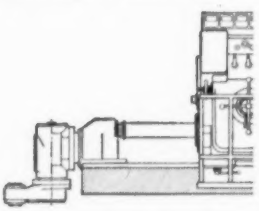
TYPICAL WAYS YOU CAN USE UNDERARM ARRANGEMENT.



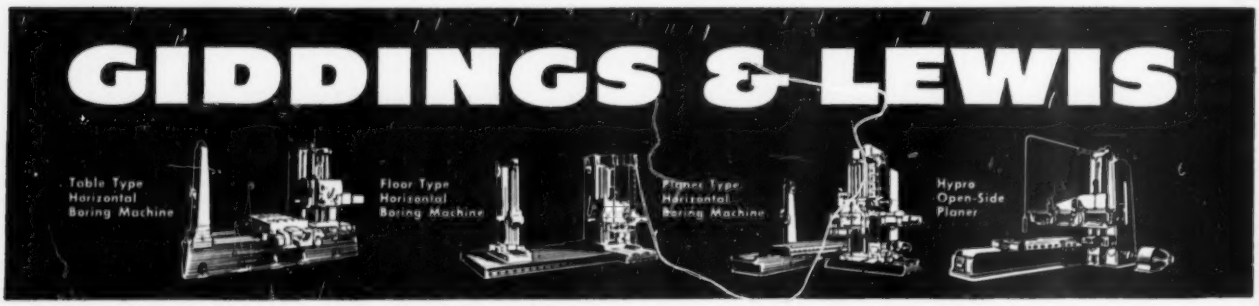
Underarm extended spindle support with continuous feed facing head.



Underarm extended spindle support with face mill.



Underarm right angle swivel milling attachment with offset arrangement.


GIDDINGS & LEWIS
Table Type Horizontal Boring Machine
Floor Type Horizontal Boring Machine
Planer Type Horizontal Boring Machine
Hypro Open-Side Planer

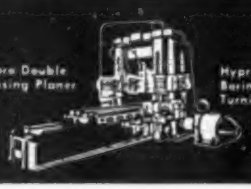
costs... castings

Here you see the angular milling attachment in action. It's cutter is driven by the main spindle through gears in both the anti-friction bearing support block and the milling head.

G-25

MACHINE TOOL CO.

Hypro Planer Type Milling Machine

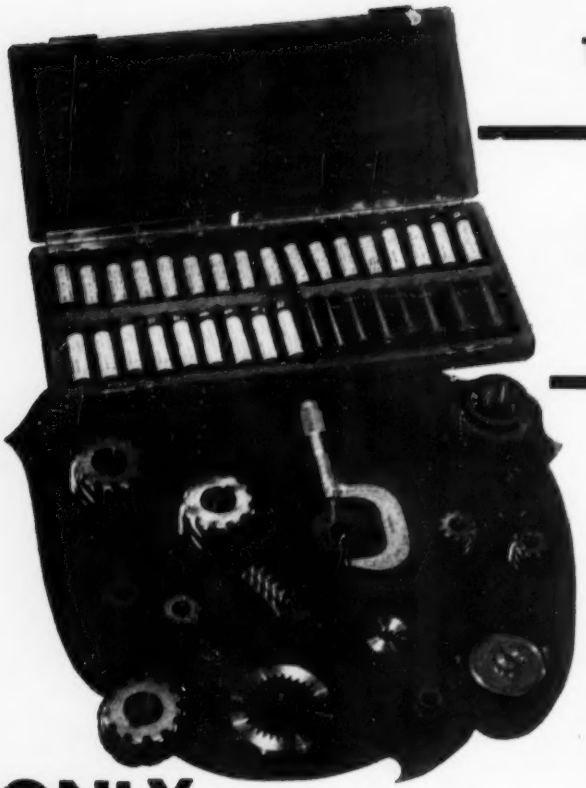


Hypro Double Housing Planer

Hypro Vertical Boring and Turning Mill

G&L HYDRO

FOND DU LAC
WISCONSIN



THE Van Keuren GEAR MEASURING SYSTEM

Set 26EX—Gear Measuring Wires, accurate to ± .000025", for common diametral pitch external spur gears.

VAN KEUREN GEAR MEASURING WIRES PROVIDE THE MOST ACCURATE AND LOW COST METHOD OF MEASURING THE TOOTH THICKNESS OF SPUR AND HELICAL GEARS, INVOLUTE SPLINES AND INVOLUTE SERRATIONS.

ONLY... EQUIPMENT NEEDED:

1—SET VK MEASURING WIRES
1—MEASURING INSTRUMENT

Complete information regarding the use of Gear Measuring Wires is contained in a 50-page section of the Van Keuren CATALOG and HANDBOOK No. 35. Included in this section are:

- . . . table of wire sizes for the 1.92", 1.728", 1.68" and 1.44" series.
- . . . tables of wire measurement including change factors for standard external and internal spur gears of 14½°, 17½°, 20°, 25°, and 30° pressure angles and of from 5 to 500 teeth.
- . . . table of relationships between depth of cut and tooth thickness for common pressure angle gears.
- . . . definitions and exact formulas covering involute spur gears.
- . . . tables of involute tooth parts for standard addendum and stub tooth involute gears.
- . . . information, formulas and examples regarding the wire measurement of helical gears.
- . . . information and examples concerning the wire measurement of enlarged pinions and reduced gears.
- . . . tables of wire measurement for involute splines.
- . . . tables of wire measurement for involute serrations.
- . . . tables of comparative measurement over three sizes of wires for use in involute profile checking.

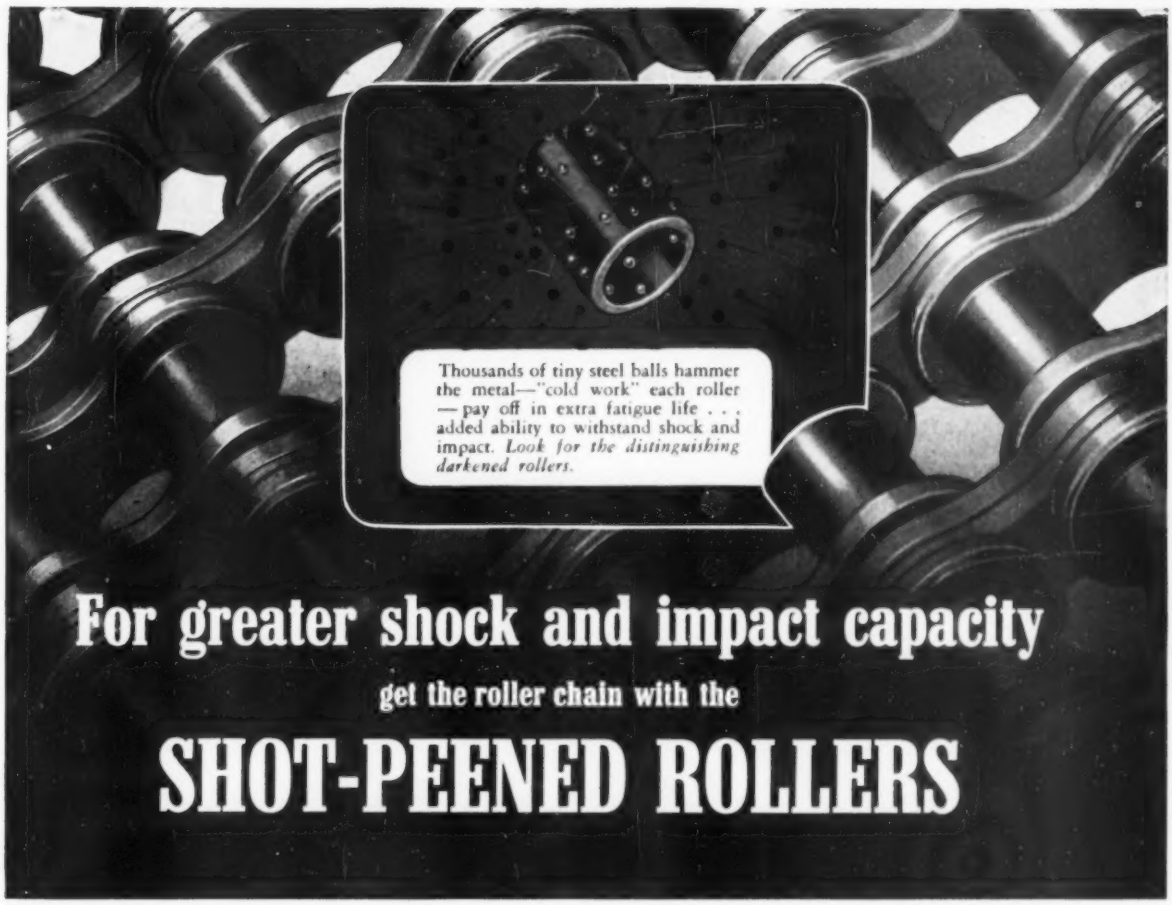
CATALOG and HANDBOOK No. 35 is available without charge by writing to: The Van Keuren Co., 173 Waltham St., Watertown, Mass. Ask for your copy.

VK
34th YEAR

THE Van Keuren CO.,

173 WALTHAM STREET, WATERTOWN, MASS.

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper I Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Cemented Carbide Plug Gages • Carboloy Cemented Carbide Measuring Wires


Thousands of tiny steel balls hammer the metal—"cold work" each roller—pay off in extra fatigue life . . . added ability to withstand shock and impact. *Look for the distinguishing darkened rollers.*

For greater shock and impact capacity

get the roller chain with the

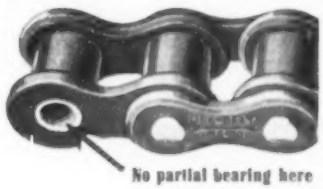
SHOT-PEENED ROLLERS

. . . one of the extra-wear features you get with every LINK-BELT Roller Chain

JUST as shot-peened rollers give you extra fatigue life—so do Link-Belt's exclusive lock-type bushings multiply roller chain's capacity to withstand shock loading. And there are many other engineering extras that make Link-Belt Precision Steel Roller Chain your best buy for drive and conveying service.

You can choose from the complete range of Link-Belt Precision Steel Roller Chain. Ask your nearest Link-Belt office for full particulars on single or multiple widths, in ⅜" through 3" single pitch, or double pitch, 1" through 3".

Lock-type Bushings increase ability to withstand severe operating conditions



No partial bearing here — bushing fits securely

A special manufacturing process securely locks the inside sidebars on the bushing, preventing lateral movement of the sidebars and eliminating a common cause of stiff chains. This Link-Belt development is applied on roller chains through 1" pitch and double pitch roller chains through 2" pitch. 12,695

LINK-BELT

PRECISION STEEL ROLLER CHAIN

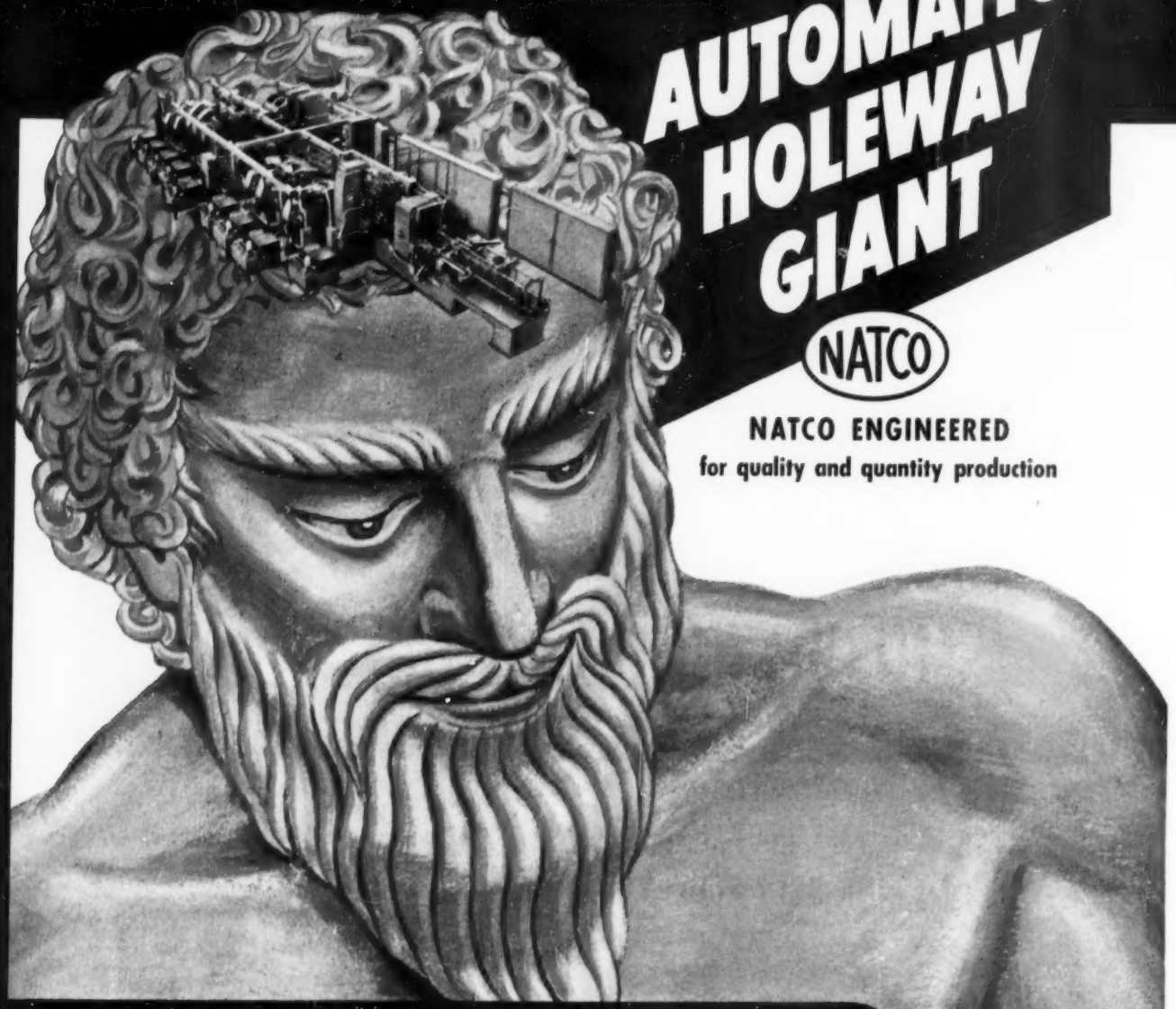
LINK-BELT COMPANY: Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa), Sydney (Australia). Offices, factory branch stores and distributors in principal cities.

See how another

AUTOMATIC HOLEWAY GIANT

NATCO

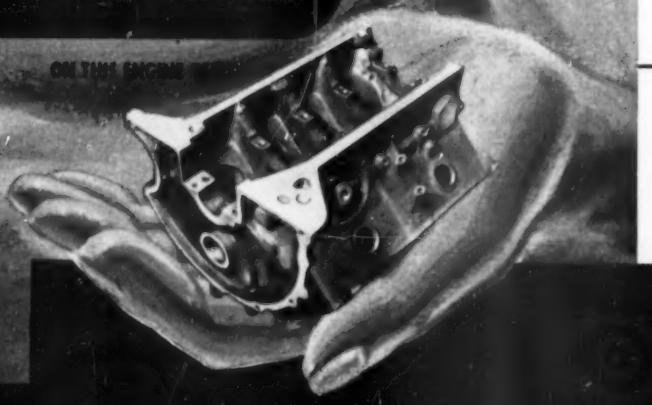
NATCO ENGINEERED
for quality and quantity production



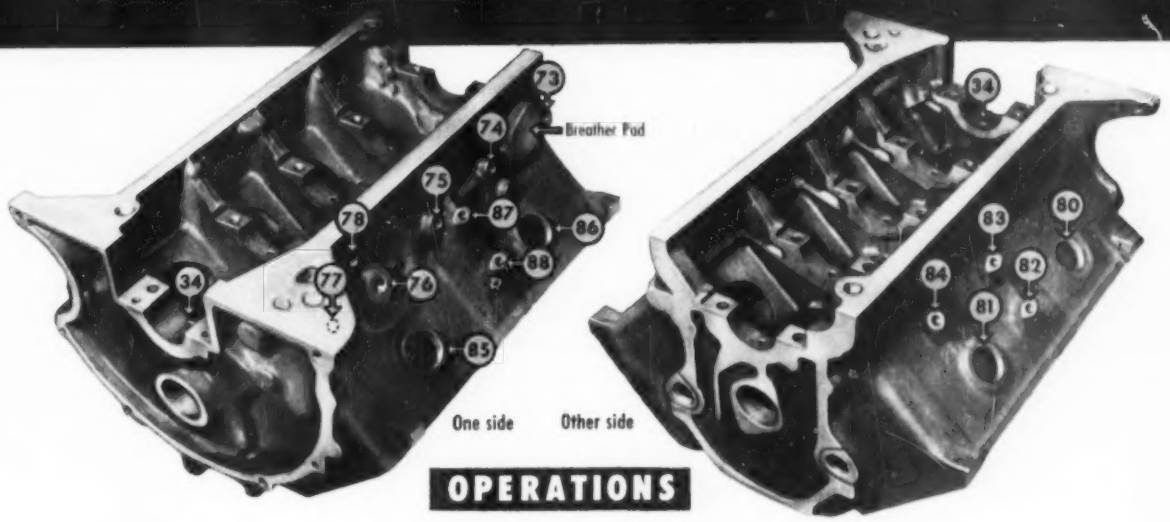
Completes all 55 operations

at the rate of nearly 2 parts per minute

including milling, drilling, combination core drilling and chamfering, reaming, combination spot facing and chamfering, combination rough counterboring and spot facing, rotating part 180° vibrating for chip removal, and inspecting Holes.



PRODUCES 111 PARTS PER HOUR and inspects its own production



OPERATIONS

STATION #1 Load 1 part

STATION #2

Right Angular Head (17° above horizontal)
- Drill 1 hole #74 to 7/16" diameter part depth.
- Drill 3 holes #73, #75 and #77 to 7/16" diameter part depth.
- Drill 1 hole #76 to 31/32" diameter part depth.

STATION #3

Right Angular Head (17° above horizontal)
- Drill 1 hole #74 to 7/16" diameter additional part depth.
- Drill 3 holes #73, #75 and #77 to 7/16" additional part depth.
- Drill 1 hole #76 to 7/16" diameter additional part depth.

STATION #4 Idle

STATION #5

Left Angular Head (45° above horizontal)
- Combination core drill and chamfer 2 holes #80 and #81 1-23/32" dia. for 1.750" ream.
- Drill 2 holes #82 and #83 to 3/8" diameter for 7/16" x 14 tap.
- Drill 1 hole #84 to 7/16" dia. through for 1/4 NPSF Thread.

Right Angular Head (45° above horizontal)
- Combination core drill and chamfer 2 holes #85 and #86 to 1-23/32" dia. for 1.750" ream.
- Drill 2 holes #87 and #88 to 3/8" diameter for 7/16" x 14 tap.

STATION #6

Left Angular Head (45° above horizontal)
- Ream 2 holes #80 and #81 to 1.750" diameter. Combination spot face and chamfer 2 holes #82 and #83 to size.

Right Angular Head (45° above horizontal)
- Ream 2 holes #85 and #86 to 1.750" diameter. Combination spot face and chamfer 2 holes #87 and #88 to size.

STATION #7 Idle

STATION #8

Left Angular Head (angle off vertical)
- Drill 1 hole #34 to 1/4" diameter 1/2 depth.

Right Angular Head (17° above horizontal)
- Combination rough counterbore for 4.94" finish diameter and spot face 1-15/16" dia. bolt boss #76.

STATION #9

Left Angular Head (angle off vertical)
- Drill 1 hole #34 to 1/4" diameter through.

Right Angular Head (17° above horizontal)
- Finish counterbore 1 hole #76 to 4.94" diameter.

STATION #10 Idle

STATION #11

Right Angular Head (17° above horizontal)
- Drill 4 holes #73, #74, #75 and #77 to 11/32" diameter additional part depth.
- Drill 1 hole #76 to 11/32" diameter additional part depth.
- Drill 1 hole #78 to 11/16" diameter .24" deep.

STATION #12

Right Angular Head (17° above horizontal)
- Drill 4 holes #73, #74, #75 and #77 to 11/32" diameter additional part depth.
- Drill 1 hole #76 to 11/32" diameter additional part depth.
- Drill 1 hole #78 to 9/16" diameter .46" depth.

STATION #13 Idle

STATION #14

Right Angular Head (17° above horizontal)
- Drill 4 holes #73, #74, #75 and #77 to 11/32" diameter to depth.
- Drill 1 hole #76 to 11/32" diameter to depth.

STATION #15

Right Vertical Head
- Mill 4" dia. seat around hole for oil breather tube.

STATION #16 Idle

STATION #17

- Rotate part 180°, vibrate while rotating from pan face up to pan face down front end loading.

STATION #18

Left Side (17° below horizontal).
- Inspect holes to be tapped for drill through and depth 5 holes #73 to #77 incl. (45° below horizontal).
- Inspect holes to be tapped for drill through and depth—2 holes #87 and #88.

Right Side (45° below horizontal)
- Inspect holes to be tapped for drill through and depth 3 holes #82, #83 and #84.

STATION #19 Unload

Oil pan face down front end loading.

Call a Natco Field Engineer

to help you solve your problems in Drilling, Boring, Facing and Tapping.

NATCO

NATIONAL AUTOMATIC TOOL COMPANY, INC., Richmond, Indiana

Branch Offices

1809 Engineering Bldg., CHICAGO • 409 New Center Bldg., DETROIT
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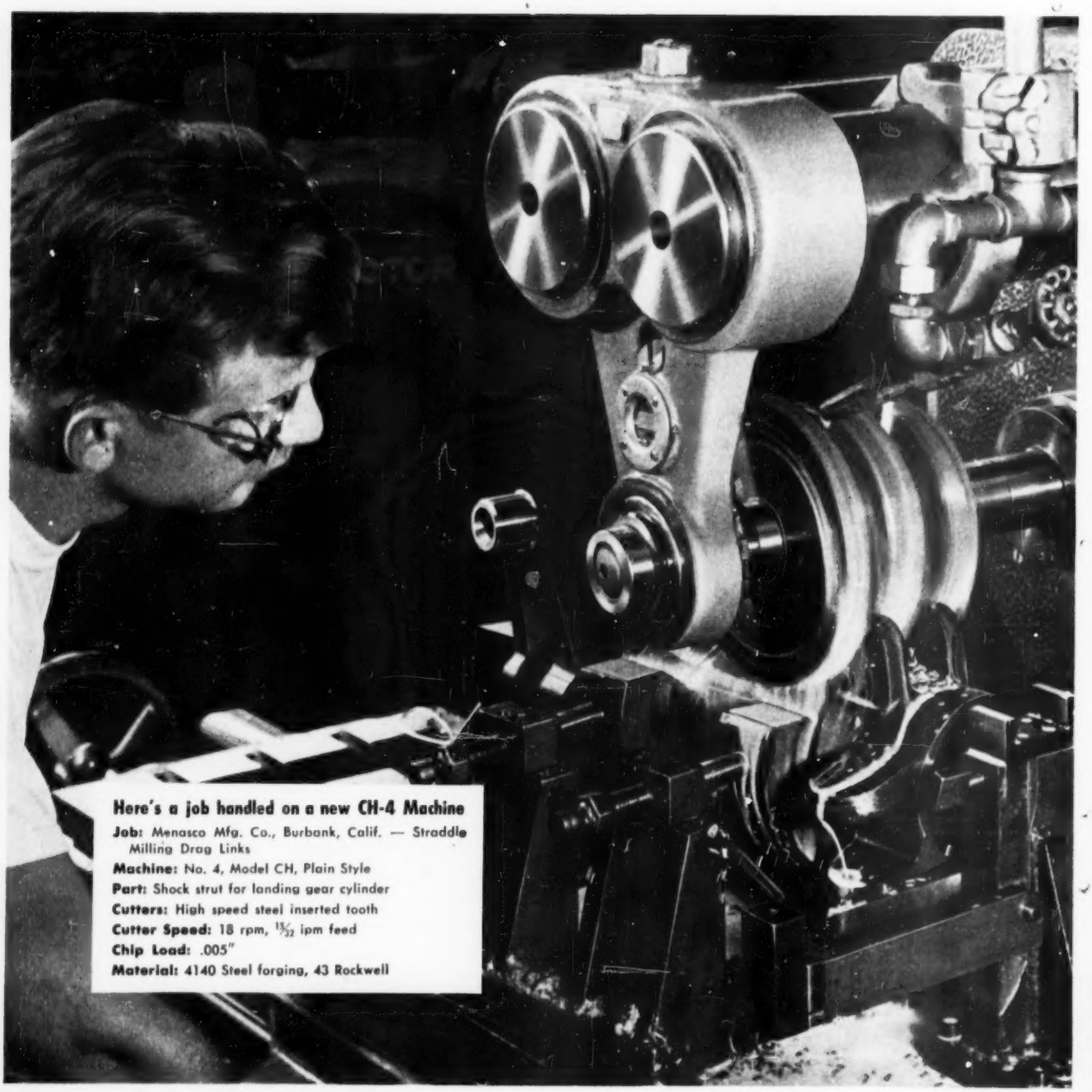
KEARNEY & TRECKER MILWAUKEE

CH MILLING SPEED, ACCURACY



Here's a job handled on a new CH-4 Machine

Job: Menasco Mfg. Co., Burbank, Calif. — Straddle Milling Drag Links

Machine: No. 4, Model CH, Plain Style

Part: Shock strut for landing gear cylinder

Cutters: High speed steel inserted tooth

Cutter Speed: 18 rpm, $^{13}/_{32}$ ipm feed

Chip Load: .005"

Material: 4140 Steel forging, 43 Rockwell

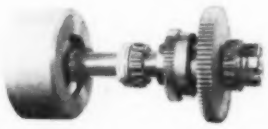
MACHINE COMBINES AND POWER

CH MILLING MACHINE FEATURES THAT HELPED DO THIS JOB BETTER

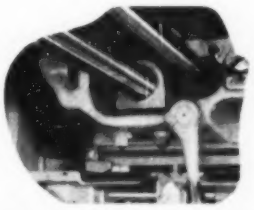
Speed range—*24* speed changes are provided from *15* to *1500* rpm. Automatic protecto-mesh mechanism permits nonclash shifting during speed changes.

Extra wide feed range — *32* changes from ¾" to *90"* per minute meet requirements of new metals and cutting tools for most efficient operation.

Greater rigidity — Entirely new column . . . heavily ribbed, box section, sponson construction . . . absorbs vibration from heaviest cutting loads.



Greater cutting efficiency through design refinements and a train of heavy duty, wide-faced, forged steel gears, hardened and specially processed for quiet operation.



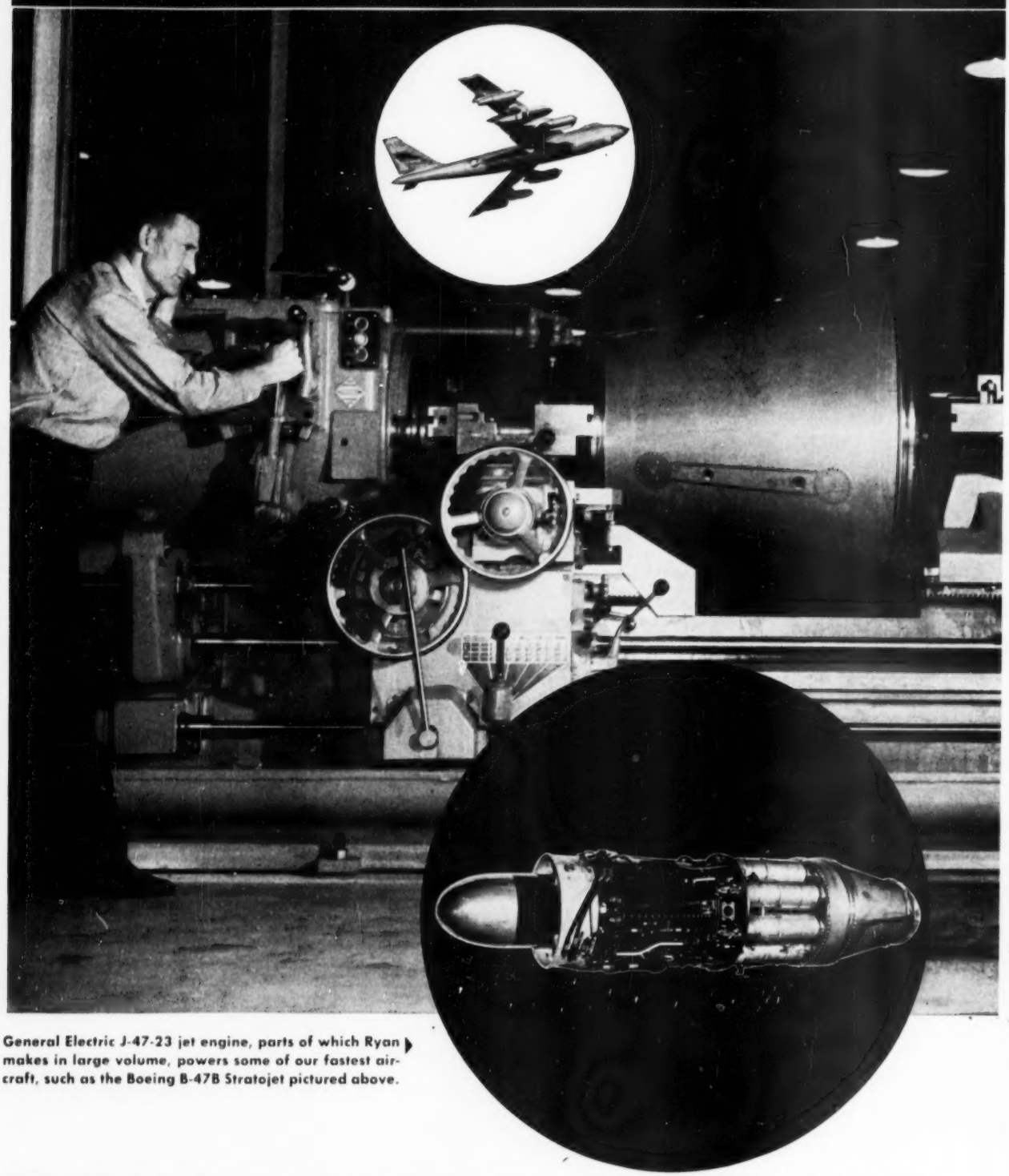
Smoother feed performance through a heavy duty *2"* dia. table feed screw. *23%* greater bearing contact between screw nut for longer screw life and accuracy.

Greater horsepower through independent drives for spindle, feed and rapid traverse, and coolant. 15 hp delivered to spindle . . . *3* hp for feed and rapid traverse . . . ¼ hp for coolant.

INVESTIGATE the new CH line of milling machines. These and other features are job proven to give you cost-cutting results plus greater productivity, better finished products. Contact our nearest representative or write: Kearney & Trecker Corp., 6784 W. National Avenue, Milwaukee 14, Wisconsin.

KEARNEY & TRECKER
MILWAUKEE
MACHINE TOOLS

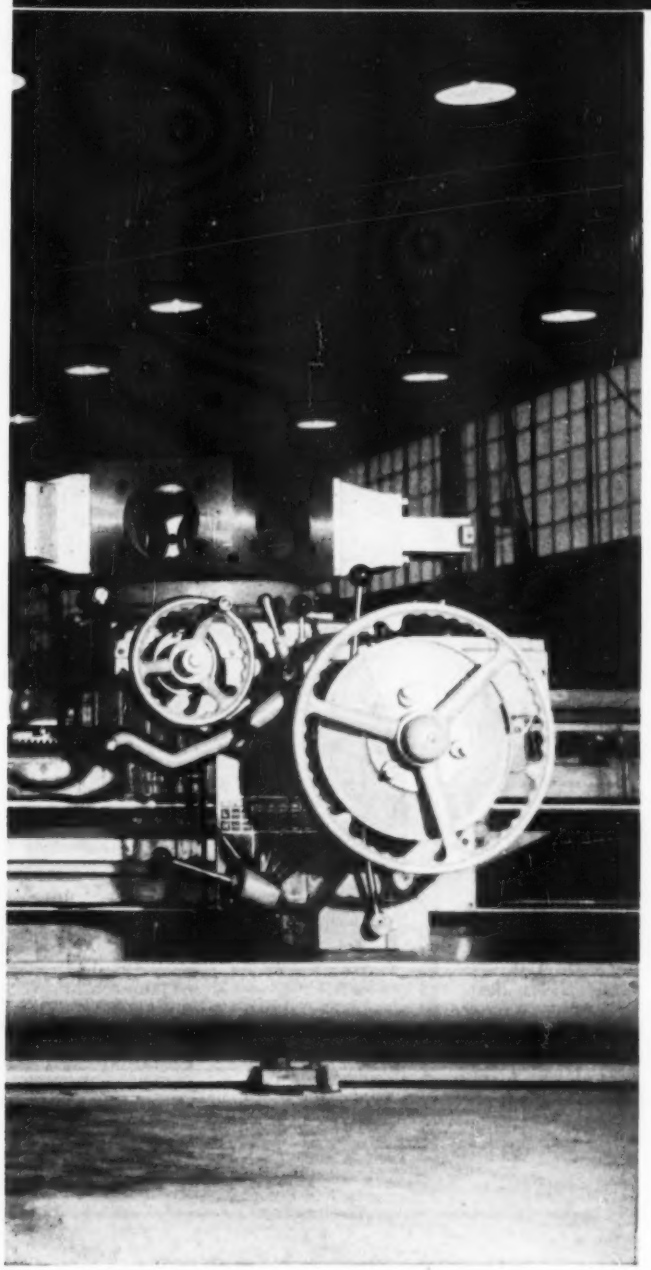
WARNER & SWASEYS HELP SPEED



General Electric J-47-23 jet engine, parts of which Ryan makes in large volume, powers some of our fastest aircraft, such as the Boeing B-47B Stratojet pictured above.

YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS WITH WARNER & SWASEY

JET ENGINE PRODUCTION . . .



Warner & Swasey 4-A Heavy Duty Turret Lathe simultaneously machining flanges on each end of exhaust cone for jet engine.

Turret lathes cut machining time in half on vital part

MACHINING TIME CUT IN HALF! Two setups replaced by one! Storage problems eliminated! Handling drastically reduced! These are reports from Ryan Aeronautical Company after the first of six modified Warner & Swasey 4-A Heavy Duty Turret Lathes took over work on one phase of jet engine components production.

This Warner & Swasey was especially designed with special tools and tool holders to machine the flanges on each end of the jet engine's big heavy-gauge, stainless steel exhaust cone. Prior to its installation, Ryan had to set up and machine the flanges on one end of each of a dozen cones, then store the cones around a machine until the new tooling setup was completed and the other ends of the cones machined

Now, with the Warner & Swasey, the flanges on both ends are machined simultaneously. Cutting tools turn and form the flanges in one pass to 50 micro-inch smoothness. Only one setup is required for each cone, and as its flanges are machined, it is sent on down the production line. Scarce floor space is saved, and handling minimized.

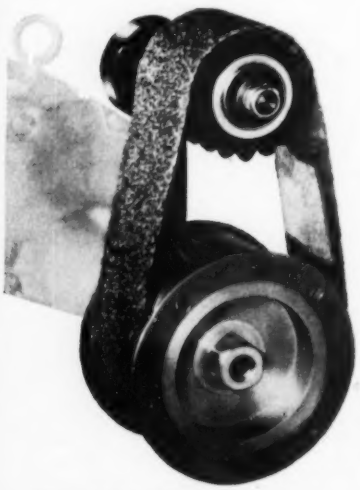
Here is another example of how a Warner & Swasey Field Engineer, working with a company's production men, helped apply Warner & Swasey experience and "know how" to solve a tough production problem. Our nearest Field Engineer will also be glad to work with you and will recommend the right machines to fill your high precision machining requirements.

WARNER & SWASEY
Cleveland
PRECISION MACHINERY SINCE 1880

MACHINE TOOLS, TEXTILE MACHINERY, CONSTRUCTION MACHINERY

2 pages of HELPFUL COST CUTTING IDEAS for YOU

"GREEN-GRIT" silicon carbide wheels in vitrified bond put keen edges and fine finishes on carbide tipped tools—to close tolerances. Recommended gradings for offhand and surface grinding, wet or dry: rough, GC60-H11-VR; finish, GC100-G5-VR.



NEW "PORT-A-BELT" Grinding Attachment quickly converts any horizontal portable grinder to a belt grinder. It's light—compact—easy to attach. It's a natural for any metalworking shop concerned with die and mold grinding, weld cleanups, edge breaking, contour finishing. Often eliminates 2 or 3 operations.

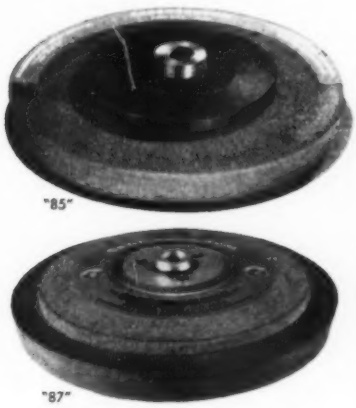
NEW RESILIENT FEED WHEELS prove ideal in centerless grinding of armatures and other work requiring light but even pressures. Wheels are standard A 80-R2-R grading, with specially designed resilient rubber center. They'll save money for every centerless user.

NEW R3 (Rubber) BOND RACEWAY WHEEL lowers costs in the bearings industry. It cuts cool, holds form—reduces regrinds and rejects. One wheel often replaces tandem mountings. You'll get far more output per wheel, too.

...from CARBO

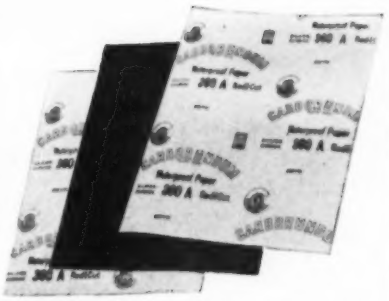
TRADE

"Carborundum", "Aloxite", "Green-Grit", "Red-I-Cut", "Fastcut", "Port-A-Belt", and "MX" are trademarks of The Carborundum Company, Niagara Falls, New York



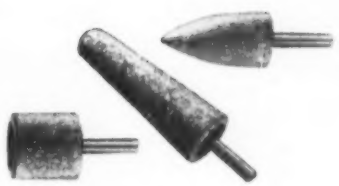
"FASTCUT" Pad 85 Assembly now permits *wet* sanding with discs, a brand new finishing method that gives better finishes in far less time. Complements the "FASTCUT" Pad 87 Assembly for dry disc sanding—another cost-cutter for you!

Abrasive **CUTTING OFF WHEELS**—from 12 to 20 times faster than steel saws—produce smoother cuts at lower cost than other, conventional, methods. Rubber bond for wet cut-off, resinoid bond for dry, "MX" for free hand... CARBORUNDUM makes the *right* wheel for any metallic or non-metallic cut-off job.

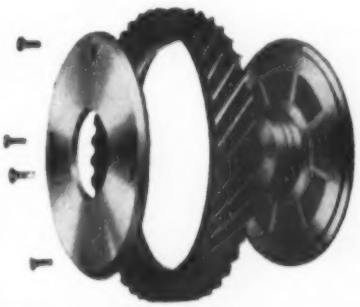


"RED-I-CUT" Waterproof Paper has revolutionized wet sanding operations in thousands of shops. With its new flexible backing and a new resin bond, you can confidently expect it to deliver a faster cut, a better finish, and up to 50% longer useful life on production runs.

RUBBER BUSHED WHEELS, used with rubber washers, are being widely adopted because they reduce vibration to a minimum in portable grinding. Results: less operator fatigue, greater output and longer wheel life. Every user of portable equipment should investigate these cost-cutting wheels.



V1 BOND, outstanding performer in internal grinding, is now saving money for users of mounted wheels and points. Why? They last longer, cut faster, hold form better, because V1 Bond is stronger, free-cutting. And for quality of finish obtained, they're unsurpassed.



"T-61" UNIVERSAL HUB CONTACT WHEEL ASSEMBLY now combines economy of longer belt life, achieved by serrated wheel surface, with equally sharp saving in wheel replacement cost. Changeable "tire" idea multiplies wheel versatility too. Hundreds of abrasive belt users are enthusiastic about results.

You profit when you STANDARDIZE on Abrasives by CARBORUNDUM

When you do business with the *only* supplier of all the types of abrasives there are, certain unique advantages are yours to enjoy:

FIRST, a control of abrasive quality which is constant, identical, and dependable—no matter what abrasive method you use.

SECOND, a technical advisory service which brings to your attention every new development in the entire field of abrasives.

THIRD, a refreshing approach to your abrasive problems which only a complete-line source, assuming complete-line responsibility, can offer. Recommendations from CARBORUNDUM are free from bias, completely objective... thus entirely dependable.

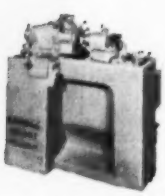
For further information on any of the ideas shown here, call your CARBORUNDUM salesman or distributor, write Dept. AM 80-31.

RUNDUM

MARK

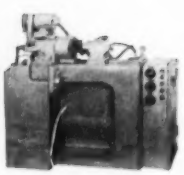
...the ONLY source for EVERY abrasive product you need

bryant
internal grinding



no. 1309-W

Finishes 2 bores and a taper straight and concentric. 2 wheelheads are used on this semi-automatic. Max. traverse stroke, 6". Max. grinding length, 3½".

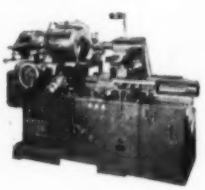


no. 1109

For high production of small bores where accuracy of size and finish are required. Max. traverse stroke, 6". Max. grinding length, 3½".

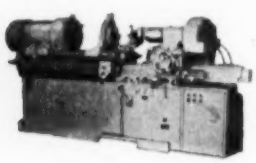
no. 1316

Two wheelheads for high production of jobs requiring face and bore, or face and O.D. grinding. Max. traverse stroke, 20". Max. grinding length, 8".



no. 1116

A general purpose hole grinder for tool room, small shop, or general production. Maximum traverse stroke, 20". Maximum grinding length, 8".

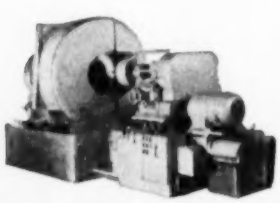


no. 1416

Specially designed for grinding bores in long work, such as machine tool spindles. Maximum traverse stroke, 20". Maximum grinding length, 8".

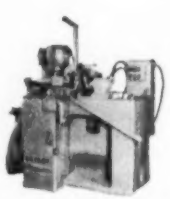
no. 1209

A fully automatic, high production machine for small and medium bore grinding. Max. traverse stroke, 6". Max. grinding length, 3".



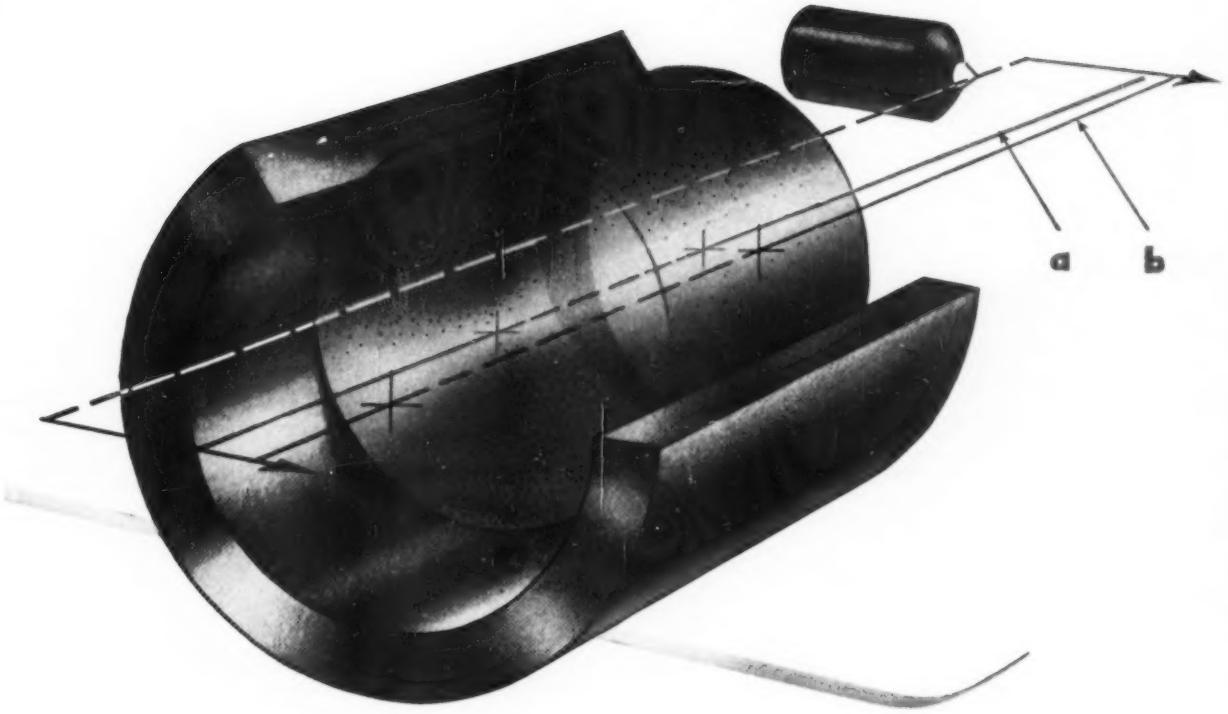
no. 1460

For production or single piece hole grinding on parts up to 60" diameter. Max. traverse stroke, 21". Max. grinding length, 16".



no. 2209

For precision and high production grinding of ball bearing races, gears, rolls, bushings, etc. Max. traverse stroke, 6". Max. grinding length, ¾".



THE heart of the internal grinding process is the line of contact between the wheel and the work. This contact line must be straight for the full length of the wheel and the full length of work as the wheel traverses. If the contact is not a straight line, the internal grinder is "out of line". Improper alignment may show up in the work as incorrect hole geometry (bell-mouth or taper) and poor surface finish. In addition, excessive wheel wear and poor wheel action may result.

Several elements contribute to the straightness of this line of contact: first, the path along which the wheel is traversed "a" must be a straight line; second, the axis of the wheel must lie in a plane parallel to the wheel path "a", and third, the axis of the work "b" must be parallel to the wheel path "a". For production grinding, the diamond must lie in the plane established by the wheel axis and the work axis.

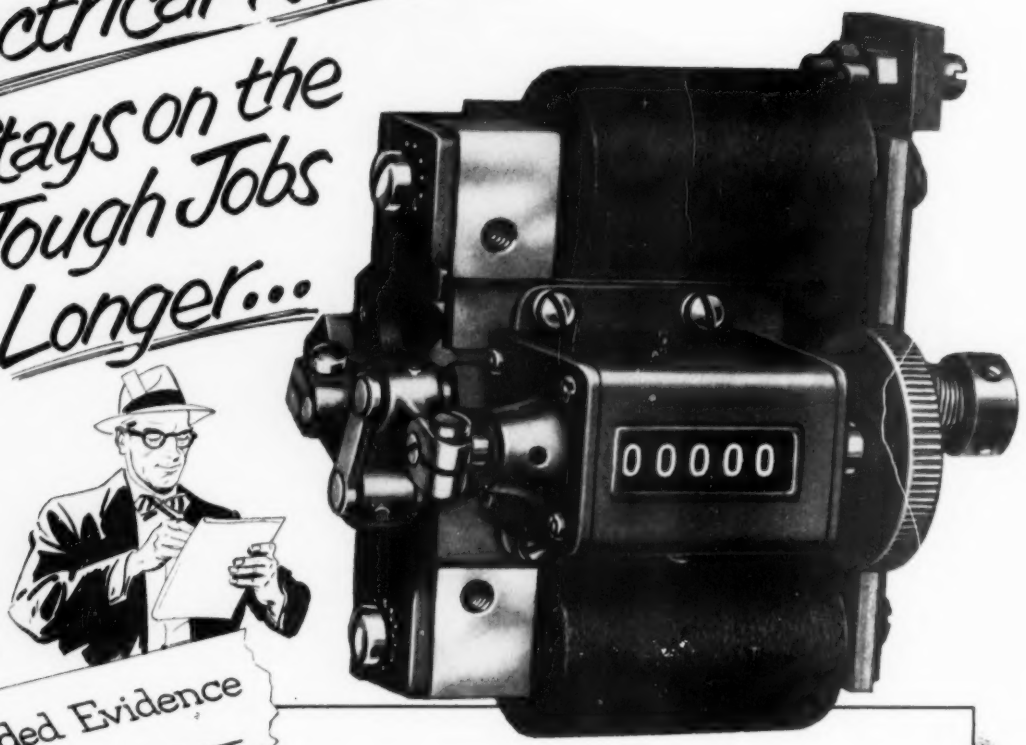
Perfect alignment means that the slides must be straight and true, the wheel and work spindles must be in line and "zeroed" for center heights and the diamond must be on "dead center" of the wheel. A full, straight line of contact will extend wheel life, improve wheel action, and will assure correct geometry and required finish.

Bryant Chucking Grinder Company

Springfield, Vermont, U. S. A.

Internal grinders • *Internal & External thread gages*

This Electrical Reporter Stays on the Tough Jobs Longer...



Added Evidence that

Everyone Can Count on VEEDER-ROOT

Compact and rugged . . . this electrically operated reset counter is specially designed for tough jobs that demand longer counter life.

Here's another instance of the *infinite applicability* of Veeder-Root *Count*rol — electrical, mechanical or manual. And here's another instance, too, of the endless resourcefulness of Veeder-Root engineering, and the ability to design a *complete counting package* that fits the job fully and exactly. Now . . . what's *your* problem?

VEEDER-ROOT INCORPORATED

"The Name That Counts"

HARTFORD 2, CONNECTICUT

Chicago 6, Ill. • New York 19, N.Y. • Greenville, S.C.
Montreal 2, Canada • Dundee, Scotland
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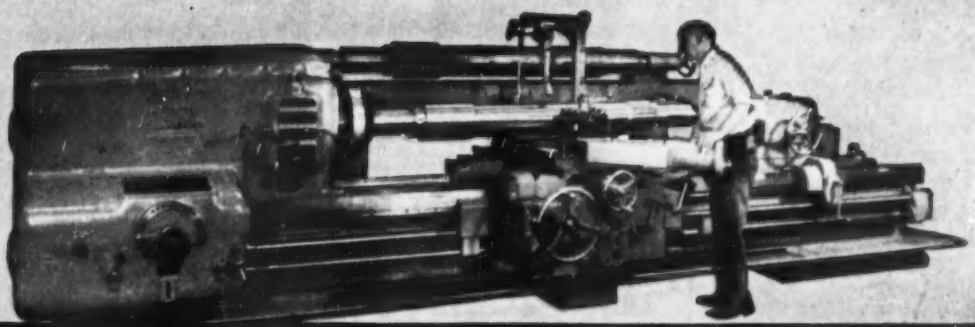
One hour

One hour to finish turn this Diesel Locomotive Driving Axle from the rough forging, removing 500 pounds of chips and using 60 horse power cuts in the process.

This shows what a 25" "AMERICAN" Hydraulic Duplicating Lathe driven by a 50 H.P. motor can do. Production records of this kind are the rule rather than the exception and are being made daily.

"AMERICAN" Hydraulic Duplicating Lathes reduce machining time 50 to 75 per cent . . . cut costs to the bone . . . pay good dividends on the investment.

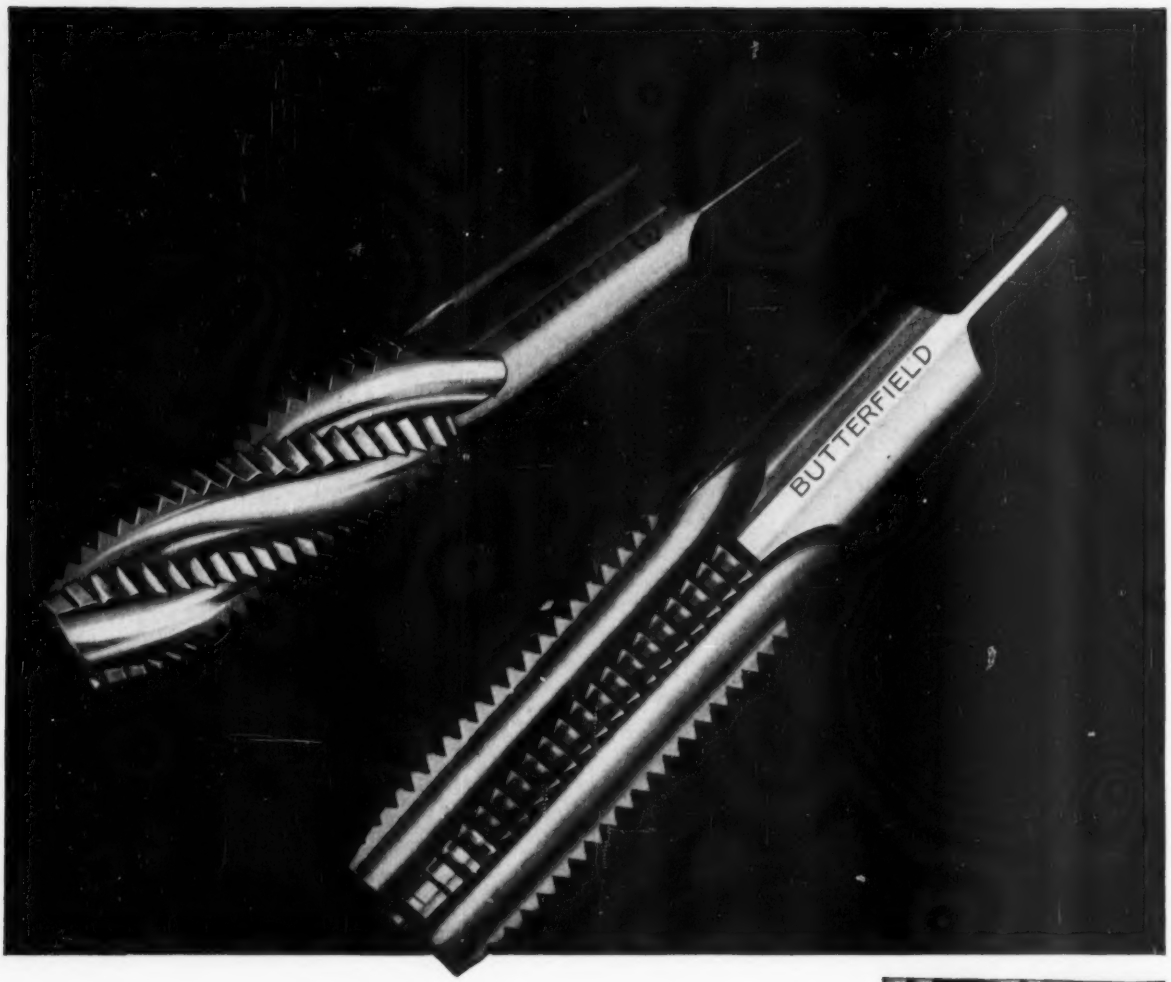
Repeat customers vouch for this in the most convincing way.



Bulletin No. 35 gives a complete description and shows many examples. It's yours for the asking.

THE AMERICAN TOOL WORKS CO. **Cincinnati, Ohio U.S.A.**

Lathes and Radial Drills



THEY BRING ASSURED ACCURACY TO YOUR TAPPING JOBS

With Butterfield Taps you eliminate all risk of getting a defective tap that has been overlooked in ordinary factory spot-checking.

Each Butterfield Tap is individually inspected to make sure it will do a fast, clean, trouble-free job of threading.

That's why continued use of these 100% inspected tools is a long range policy that pays off in smoother, more economical production.

In the complete Butterfield line there's a tap for best results in every tapping application, in every material. Union Twist Drill Company, BUTTERFIELD DIVISION, Derby Line, Vermont. *In Canada:* Rock Island, Quebec.

INSPECTOR checks thread form and lead on a Hartness Comparator that magnifies 62½ diameters. Part of Butterfield's 100% inspection.

Hand Taps • Machine Screw Taps • Pipe Taps
Stove Bolt Taps • Pulley Taps
Staybolt Taps • Boiler Taps • Nut Taps
Serial Taps • Mud or Washout Taps

SEE YOUR NEARBY BUTTERFIELD DISTRIBUTOR FOR PROMPT DELIVERIES AND SERVICE

BUTTERFIELD

THE 100% INSPECTED TOOLS

Every Tool Individually Inspected

TAPS • DIES • REAMERS • SCREW PLATES

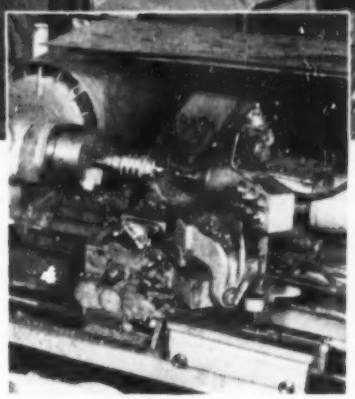
THIS EARLY BIRD GETS THREE TIMES THE WORMS!

That's the Mona-Matic for you!

"THREE TIMES THE OUTPUT!", says Gar Wood Industries, Inc., of their new Mona-Matic installation. Output has increased, on turning these worm shafts, from 2 pieces formerly put on the floor every 14 minutes, 45 seconds to 2 pieces every 4 minutes, 9 seconds —one man operating two machines in each case. That's more than a 255% production increase for the Mona-Matics!

There's a great performance story here, too. Only a machine built like the Mona-Matic can deliver satisfactory finish and good tool life while maintaining required limits on the intermittent cut over the forged worm threads. The 2-speed motor on Machine #1 easily accommodates the turning of diameters as varied as those of worm threads and shaft end. Excessive stock removal from small end diameter is accomplished by dual template control on Machine #2. With two tools on rear slide of each machine, one faces the end of the shaft while one rough faces a shoulder and forms an undercut.

Here's a machine that can boost output and cut costs on long runs and short ones. Why not find out —right now—what it can do for you? Write for Booklet 1805 containing full information, data, job reports. It's new! . . . *The Monarch Machine Tool Company, Sidney, Ohio.*



Part—Worm Shaft. **Material**—SAE 8640 forging. **Operation**—turn complete for grind using carbide tools. Limits ± .001". **Comment**—with one operator for two machines in each case, output has soared from 2 pieces every 14 minutes, 45 seconds to 2 pieces every 4 minutes, 9 seconds—a 72% reduction in machining!

Monarch

ACCURACY • ECONOMY • LONG LIFE

TURNING MACHINES

FOR A GOOD TURN FASTER . . . TURN TO MONARCH

how much can you save with a Lodge & Shipley COPYMATIC

SAVINGS REPORTED BY FAMOUS MANUFACTURERS

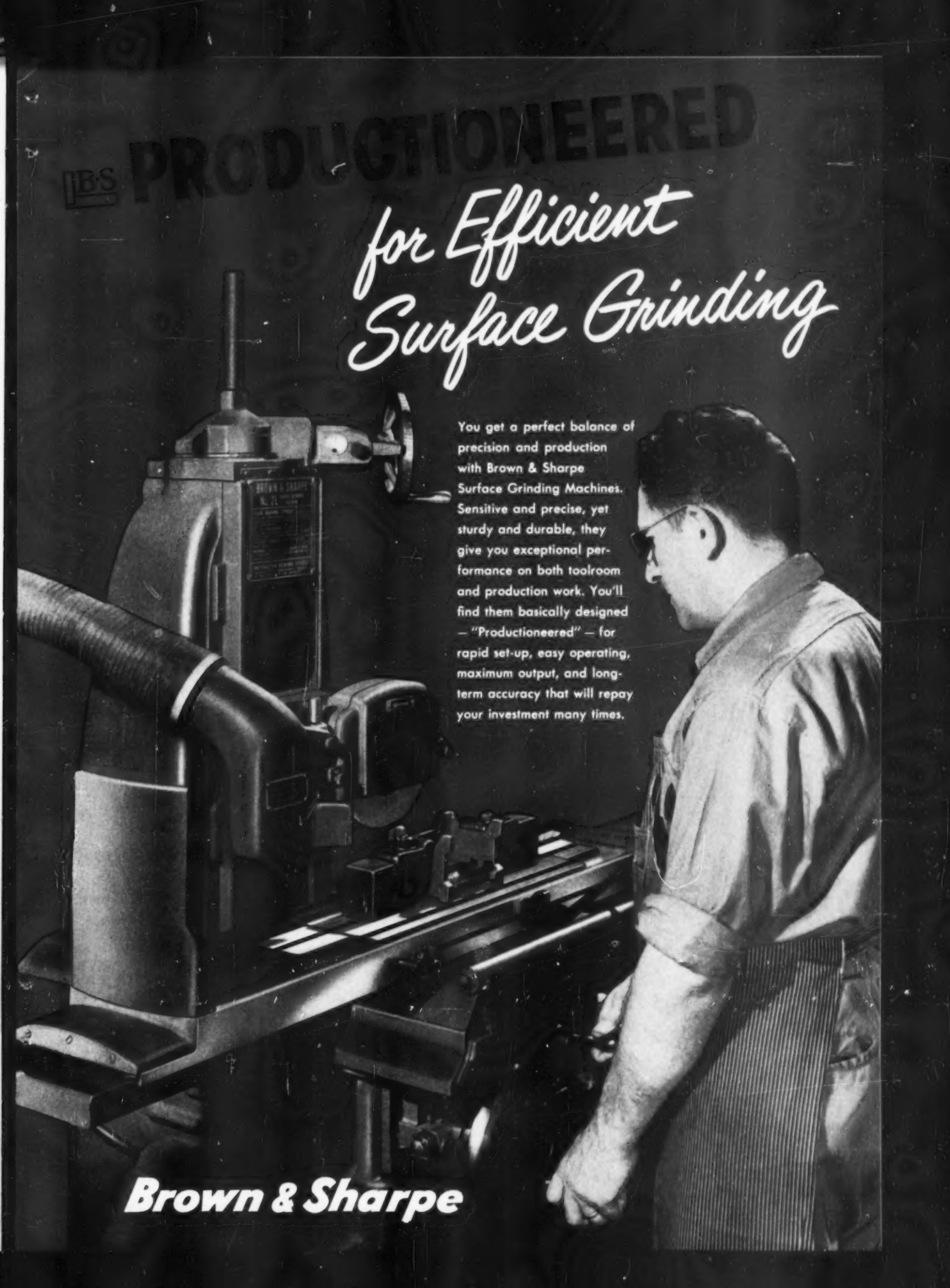
FIRM	PART	TIME SAVINGS
Automatic Transportation Co.	Armature shaft	55%
Bay City Shovels, Inc.	Worm gear shaft	70%
Canadian Arsenals, Ltd.	Heavy spindle	60%
Harnischfeger Corp.	Pinion shaft	40%
Hydraulic Press Mfg. Co.	Valve parts	50%
Indiana Gear Works, Inc.	Helicopter gearing	50%
Link-Belt	Transmission shaft	50%
Lockheed Aircraft Corp.	Engine mount lug	87%
Magna Mills Products	Dural extrusion	33%
Norris Stamping & Mfg. Co.	Auto rim rolls	50%
D. H. Prutton Machy. Co.	Machine spindle	85%
Solar Aircraft Co.	Jet engine parts	22%
Wyman-Gordon Corp.	Aluminum extrusions	50%

If you have lathe work that's adaptable to the Lodge & Shipley COPYMATIC, there's no reason why you, too, can't enjoy savings comparable to those shown above. On every installation, owners report significant advantages. With one, it may be a time saving as high as 87%. With another, a production increase as much as 536%. Still another finds an overall saving of $14,000 in one year or the fact that one COPYMATIC replaced three older lathes.

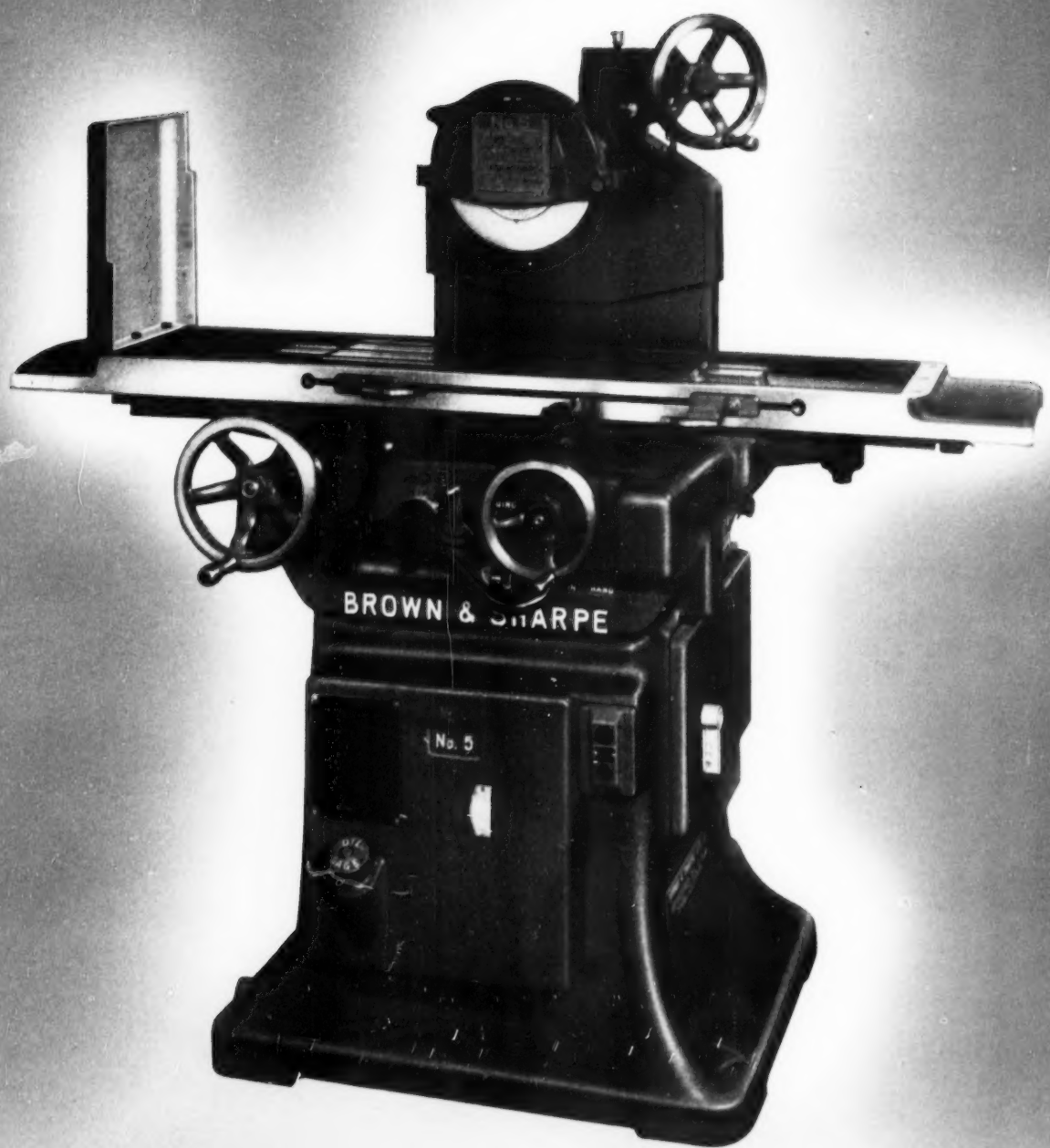
Best of all, the COPYMATIC is so versatile, combining the speed of automatic duplication with the precision and adaptability of the famous Model X Lathe, practically any shop can use it profitably.

Write for detailed COPYMATIC case histories or a demonstration of your own parts on a COPYMATIC.

THE Lodge & Shipley COMPANY
MACHINE TOOL DIVISION • 3059 COLERAIN
CINCINNATI 25, OHIO


PRODUCTIONEERED
for Efficient
Surface Grinding
You get a perfect balance of precision and production with Brown & Sharpe Surface Grinding Machines. Sensitive and precise, yet sturdy and durable, they give you exceptional performance on both toolroom and production work. You'll find them basically designed — "Productioneered" — for rapid set-up, easy operating, maximum output, and long-term accuracy that will repay your investment many times.
Brown & Sharpe

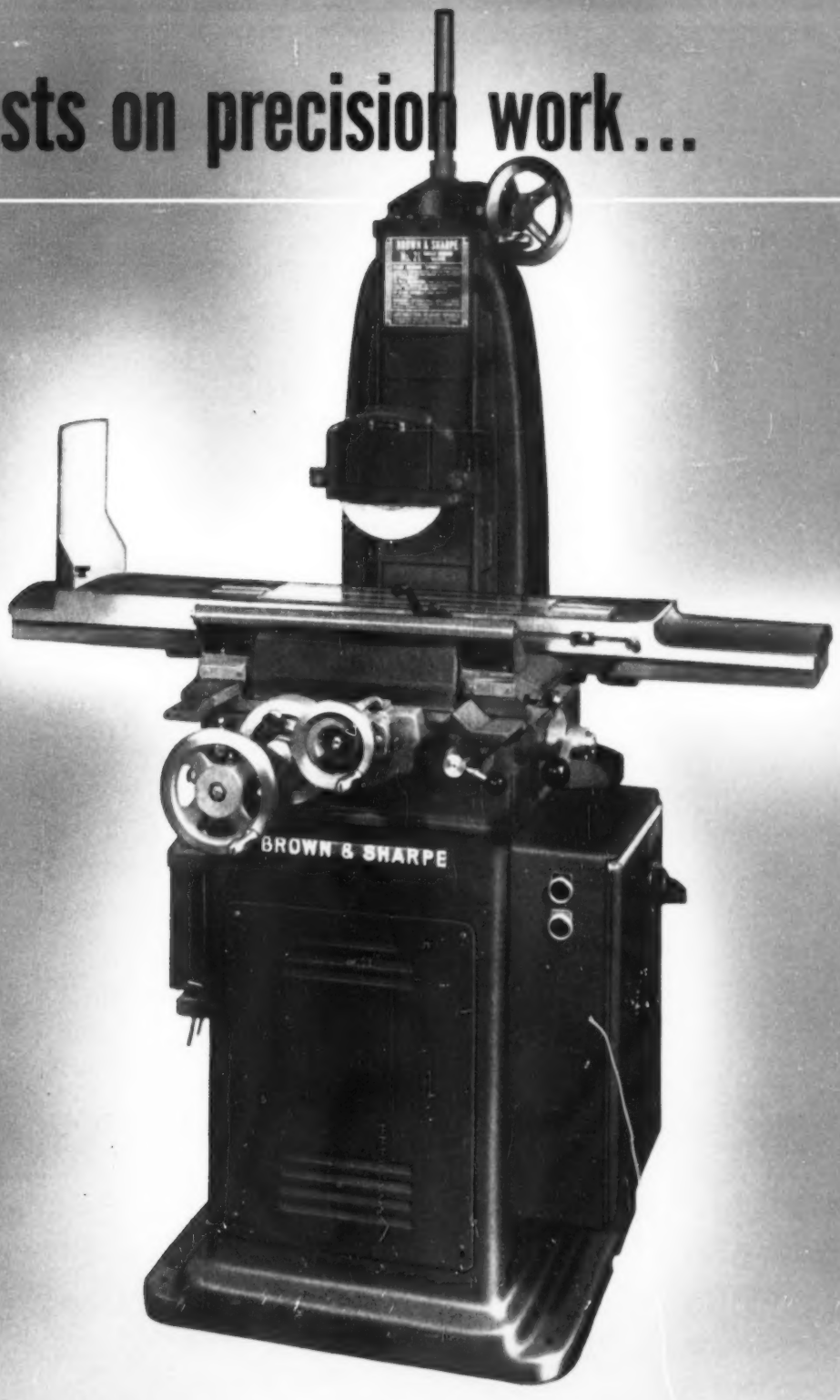
B·S "Productioneered" to cut



Brown & Sharpe No. 5 SURFACE GRINDING MACHINE

Where precision, fine finish, and rapid stock removal on flat surfaces are equally important, this productive hydraulic-type machine quickly pays for itself. Automatic hydraulic table feeds are powerful, smooth, quiet and infinitely variable. Centrally-located controls permit rapid set-up and easy operation. Flange-mounted removable unit-type wheel spindle provides accuracy of alignment — choice of plain-bearing or antifriction-bearing types. You'll find many other features for speed, safety, accuracy and long life that make the No. 5 ideal on both toolroom and production grinding for work up to 24" long, 8" wide and 11" high.

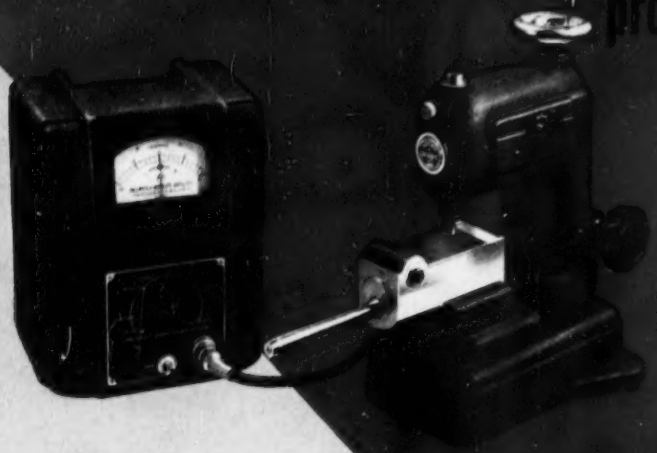
costs on precision work...



Brown & Sharpe NOS. 2L and 2LB SURFACE GRINDING MACHINES

These machines, long famous for their economical production of small to medium-sized precision work, give you the advantages of automatic lubrication and ample guarding to reduce maintenance costs and extend machine life. Removable unit-type precision wheel spindle, plain-bearing or antifriction-bearing — and rigid column construction—provide exceptional grinding finish with quick spark-out. The No. 2LB Machine with Hand Feeds Only is ideal for toolroom and production work where automatic feeds are not used. No. 2L (illustrated) and No. 2LB grind work to 18" long, 6" wide and 9½" high, using a wheel 7" in diameter.

"Productioneered" to aid in uniformly accurate production from your machines



BROWN & SHARPE
ELECTRONIC MEASURING EQUIPMENT

Precision gaging and inspection as close as .00001" are simple and fast with this equipment that practically eliminates human error — for external or internal measuring.

BROWN & SHARPE
PERMANENT MAGNET CHUCKS

These Permanent Magnet Chucks eliminate clamps, vises, and fixtures on many jobs . . . they're the time-saving way to solve work-holding problems. No operating costs, no electrical connections, no heating. Just turn lever and work is held firmly. Rotary and rectangular models. Wide range of sizes.

For sale only in the United States of America and its Territories.

BROWN & SHARPE
No. 616 CYLINDRICAL GRINDING AND INDEXING ATTACHMENT

This versatile attachment makes possible dry grinding of small cylindrical work on surface grinders. Accommodates tapers and work requiring indexing. Grinding is done on dead centers. Indexing spring chuck, with spring collets, holds work not ground between centers. Centers swing 6" diameter — take 5¼" length. Table tilts to 45°.

WE URGE BUYING THROUGH THE DISTRIBUTOR

WRITE FOR COMPLETE INFORMATION ON ANY OF THE BROWN & SHARPE PRODUCTS LISTED AT RIGHT.

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Brown & Sharpe [illegible]

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Machine Tool Accessories • [illegible]
Electronic Measuring Equipment • Permanent Magnet Chucks

Brown & Sharpe Mfg. Co., Providence 1, R. I., U.S.A.

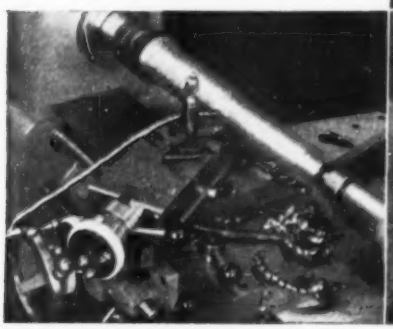
HARDINGE
ELMIRA, N.Y.

TOOL ROOM LATHE

Features QUICK *Feed Change*

Simply TURN KNOB FOR EXACT FEED REQUIRED

CHANGE FEEDS WITHOUT STOPPING SPINDLE OR CHANGING OR SHIFTING GEARS

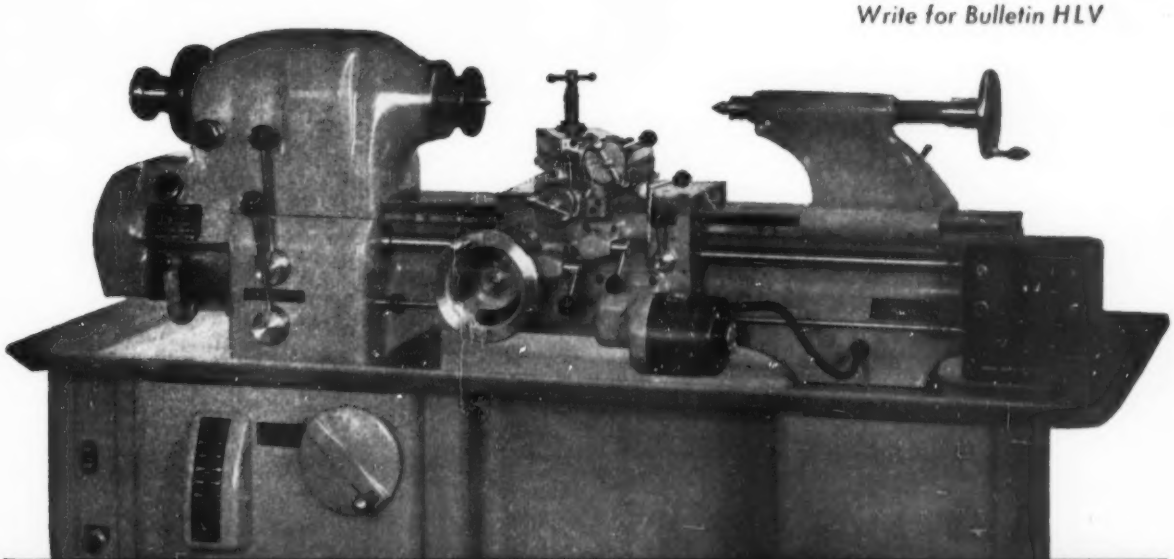


COARSE FEED

MEDIUM FEED

FINE FEED

Write for Bulletin HLV



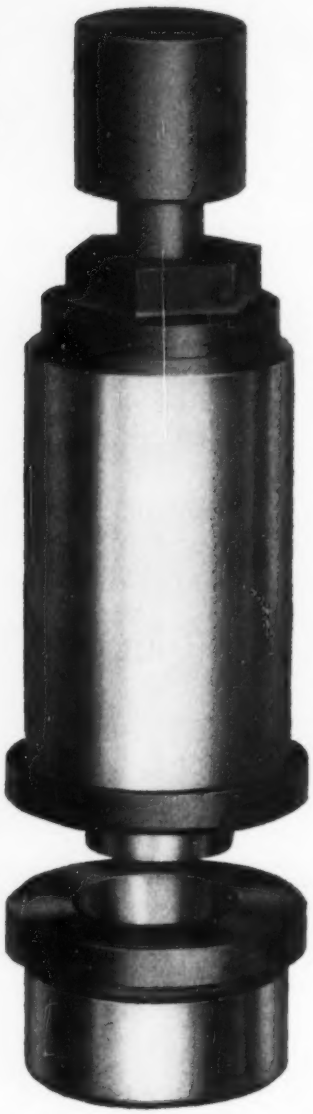
HARDINGE BROTHERS, INC., ELMIRA, N. Y.

STANDARDIZED

UNIVERSAL INDEX PLUNGERS

SAVE TIME
SAVE MONEY

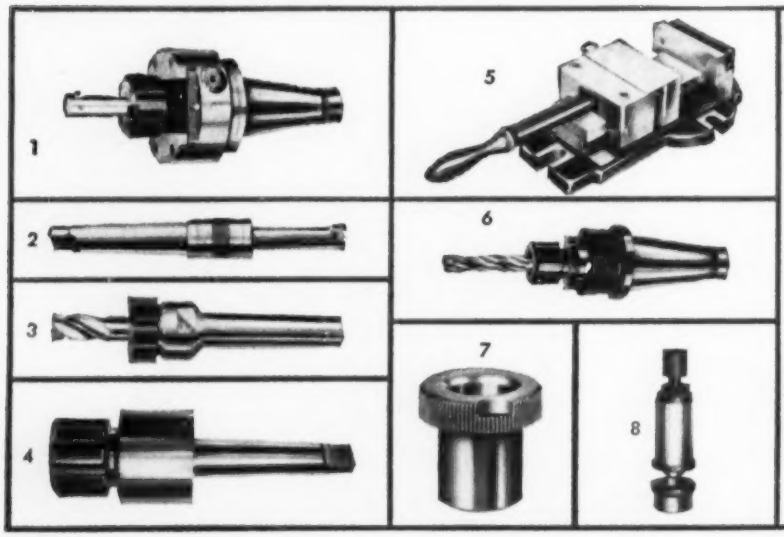
Universal's Straight and Taper Plungers made in standard sizes save the time and expense of designing and machining special index plungers for multi-station tools. They come to you complete, ready for installation at approximately ¼ the cost of specially made plungers.



Soft pin knob permits connection to actuating lever or air cylinders by several different methods. Locating bushing, plunger and plunger bushing are hardened and ground.

Plunger is easily assembled from either top or bottom. And it can be removed in either direction by removal of hex nut.

Universal Plungers greatly simplify jig or fixture manufacture because plunger body and bushing have same diameter so that all holes can be bored with same tool, often in same setting.

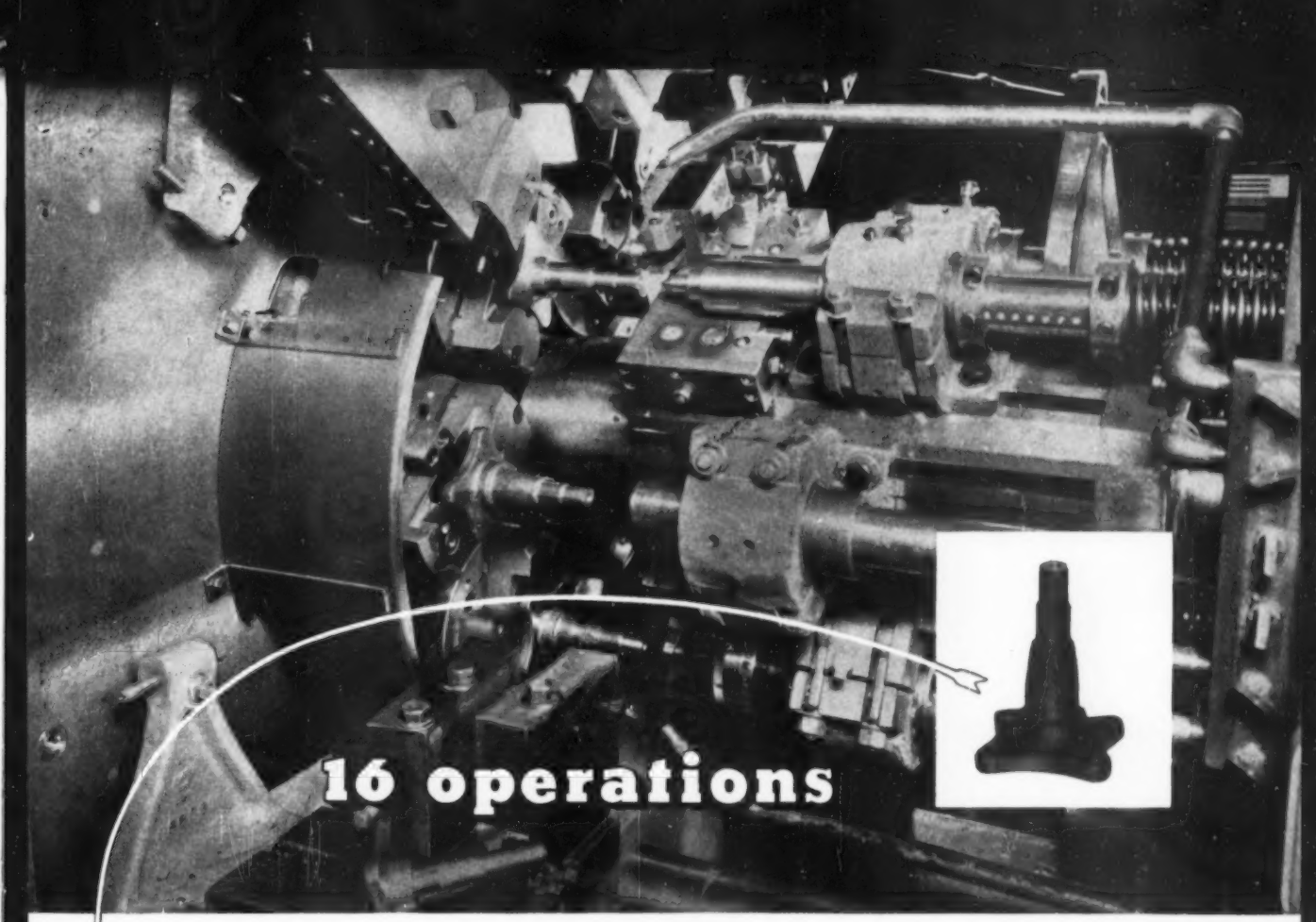


UNIVERSAL ENGINEERING COMPANY

FRANKENMUTH 1 MICHIGAN

(1) BORING CHUCK
(2) MIKRO-LOK BORING BAR
(3) STANDARD COLLET CHUCK
(4) FLOATING COLLET CHUCK
(5) WEDGE-LOCK PRODUCTION VISE
(6) "KWIK-SWITCH" TOOL HOLDER
(7) STANDARD DRILL BUSHING
(8) UNIVERSAL INDEX PLUNGER

168



in 16 seconds

on an 8-inch, 6-spindle ACME-GRIDLEY Hydraulic Chucker

When Willys-Overland Motors, Toledo, O. changed methods to cut machining costs on larger production runs of this forged wheel spindle, they didn't buy the machine on general claims. *They bought guaranteed end results—16 operations in 16 seconds.*

They bought a carefully engineered plan of tooling for this particular job—with hydraulic centering loader, unique toolholder combinations for the 16 carbide insert tools, including 5 interrupted cuts on the flange face at 860 S.F.M.

There is another reason—Willys-Overland, like all other big automotive firms, has employed scores of Acme-Gridley Bar Automatics from 10 to 30 years. Based on this experience, it is logical that they seek our advice about advanced practices in tool engineering of Chucking Automatics.

For, no other source offers so much in design and tooling experience on bar and chucking automatics—more than 45,000 machines built.

For end results, cost savings, ask your engineers to contact ours.

JOB FACTS

PART	**Front Wheel Spindle**
SIZE	**5¼" long, 4⅜" swing**
MATERIAL	**Steel forging, AISI-C1040**
OPERATIONS	**16, all with Carbide Tools**
MACHINE TIME	**16 seconds (225 per hr.)**

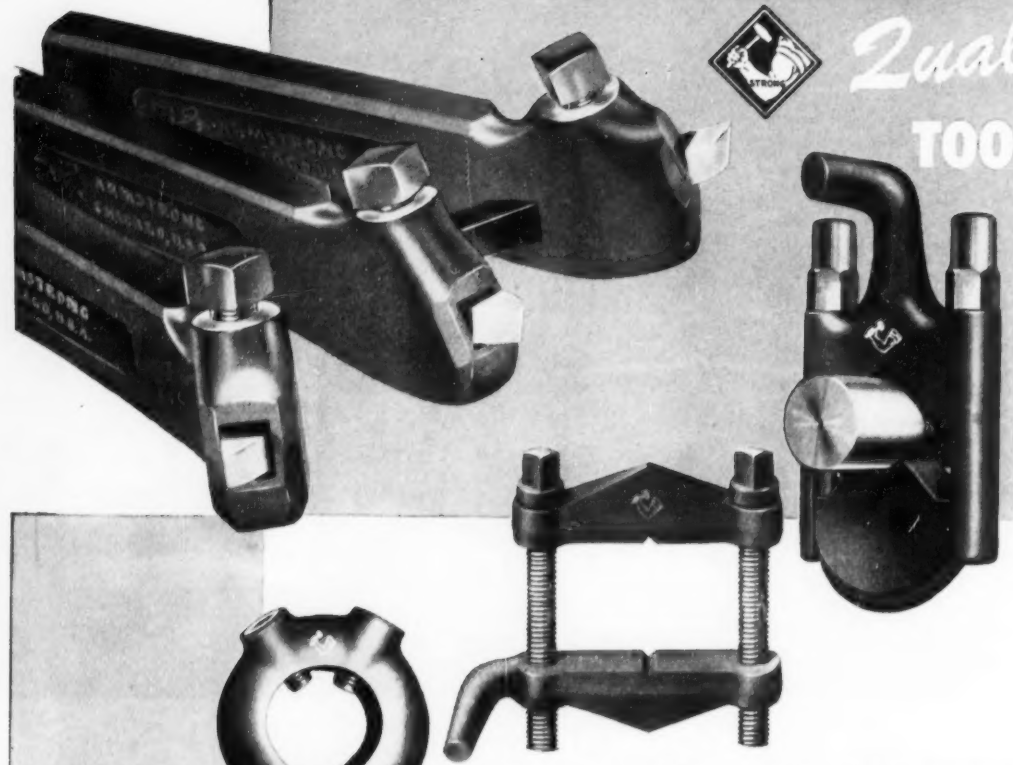
The NATIONAL ACME COMPANY

170 East 131st Street • Cleveland 8, Ohio.

ACME-GRIDLEY BAR AND CHUCKING AUTOMATICS (1-4-6 AND 8 SPINDLE) • HYDRAULIC THREAD ROLLING MACHINES • AUTOMATIC THREADING DIES AND TAPS • LIMIT, MOTOR STARTER AND CONTROL STATION SWITCHES • SOLENOIDS • CONTRACT MANUFACTURING

ARMSTRONG

Quality TOOLS



NOT A COST, BUT AN INVESTMENT

That Pays Year After Year . . .

Buy ARMSTRONG TOOL HOLDERS and TOOLS for today's job and they will bring you added profits thru the years. With ARMSTRONG TOOL HOLDERS you will be permanently tooled up for whatever comes, for each is a multi-purpose tool that takes cutter bits ground to many shapes. Each is an efficient tool, refined thru a half century of world wide use. Each has strength beyond any need, extra strength resulting from endless research and the most modern closely controlled manufacturing methods.

ARMSTRONG TOOL HOLDERS are inexpensive too, for they are produced in great numbers. They are instantly available because they are carried in stock by all leading supply houses in sizes and types for every operation on lathes, planers, slotters and shapers; for standard operations on turret lathes and screw machines. They are profitable in use because they permit the highest speeds and heaviest feeds and "Save: All Forging, 70% Grinding and 90% High Speed Steel."

ARMSTRONG Lathe and Milling Machine Dogs are permanent tools too. They are drop-forged from special open hearth steel, are heat treated to extreme stiffness and toughness. They have alloy steel screws hardened at the tip to prevent up-setting and have double life, for hubs are made oversize to permit re-tapping.

ARMSTRONG Quality pays back over and over again. *Write for new S-48 catalog.* It offers many opportunities to conserve profits.

ARMSTRONG BROS. TOOL CO.

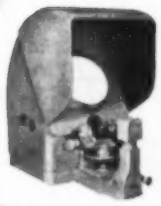
"The Tool Holder People"

5215 W. ARMSTRONG AVENUE • CHICAGO 30, ILL.

11 MODELS

3 SCREEN SIZES

Pedestal Type
14" Diam. Screen



Bench Type
14" Diam. Screen
4 Models

Bench Type
3¾" x 7¾" Screen
3 Models

Unsurpassed Inspection Versatility

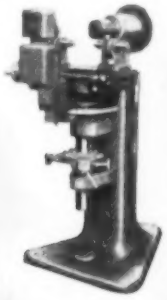
JONES & LAMSON OPTICAL COMPARATORS

The Essence of Quality Control

Jones & Lamson Optical Comparators are designed and built like rugged machine tools to withstand vibration and hard use. Yet they have the built-in accuracy to satisfy the most exacting laboratory standards.

- **They meet** the requirements of toolroom, laboratory and production inspection.
- **They precisely measure** height, depth, lead or spacing, as well as angles to degrees and minutes. They will measure to .0001".
- **They compare** intricately contoured parts with a master outline—and measure the amount of error.
- **They are convenient** to operate, easy to set up and read direct—*without computation.*
- **They operate** under normal lighting conditions. *No darkroom is needed.*
- **They will photograph** the enlarged shadow and record its relationship to a master chart.
- **Several persons** may study the shadow *at the same time.*
- **They will inspect** and measure surface contours, as well as profiles of objects such as type faces, stamping dies, punches, worn tools, etc.

Vertical Type
14" Diam. Screen



Direct
Projection
Type

Pedestal Type
30" Diam. Screen

P.S. A complete line of STANDARD CHARTS and FIXTURES is maintained by us.

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JONES & LAMSON MACHINE COMPANY
502 Clinton St., Springfield, Vt., U.S.A.

Machine Tool Craftsmen Since 1835

COMPARATOR DIV.
Dept. 710

Jones & Lamson Machine Company
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Springfield, Vermont, U. S. A.
Please send Comparator Catalog No. 402.

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COMPANY _____

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IMMEDIATE DELIVERY

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TELEPHONE.....VAlley 2967
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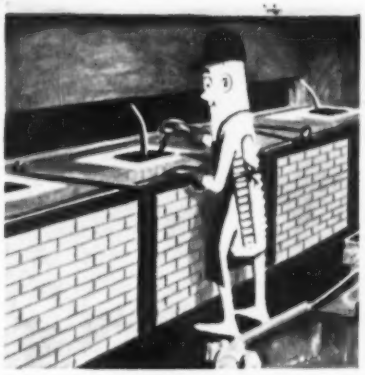
BOYE' & EMMES MACHINE TOOL CO.
125 CALDWELL DRIVE • CINCINNATI 16, OHIO

TAP-ODDITIES



At work — Pete gives heat treatment
To Bath Taps, to the right degree.
Such "hardening in the solid"
Builds uniformity!

At home — Pete "heat treats" Junior
With a common leather strap!
Such "hardening in the solid"
Builds "a chip off the old tap".

Proper heat treating of all Bath Tap blanks before the threads are ground is an important part of the Bath process — assured by constant check of procedure under the guidance of expert technicians in a well equipped metallurgical laboratory.

Hardening in the solid, produces blanks with ideal steel structure — no danger of over-heating thin and delicate threads or thread softness from under-heating.

Grinding of shanks, major diameter and flutes on precision centers, guarantees Bath Taps to be concentric. Polishing of the flutes is followed by the final operations — thread grinding and chamfering from the solid to insure uniformity and accuracy.

Insist on Bath Taps and Gages — carefully manufactured for those who prefer top quality and precise performance.

INSIST ON BATH TAPS
— PROFIT BY THEIR
PLUS — PERFORMANCE

JOHN BATH CO. INC. WORCESTER MASS

PLUG AND RING THREAD GAGES • GROUND THREAD TAPS • INTERNAL MICROMETERS

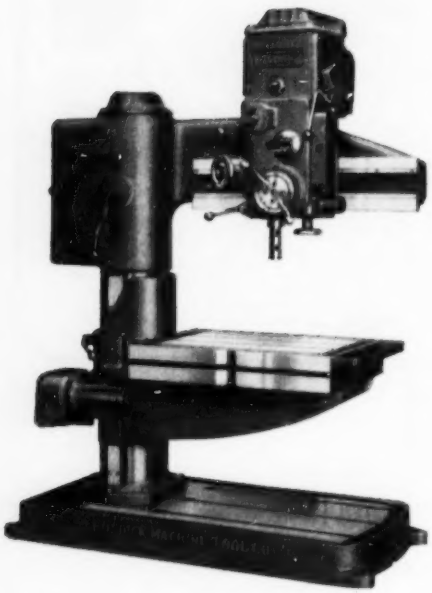
JOHN BATH CO. INCORPORATED
22 Grafton St., Worcester, Mass.

FOSDICK

precision

positioned holes

production



SENSITIVE RADIAL DRILL

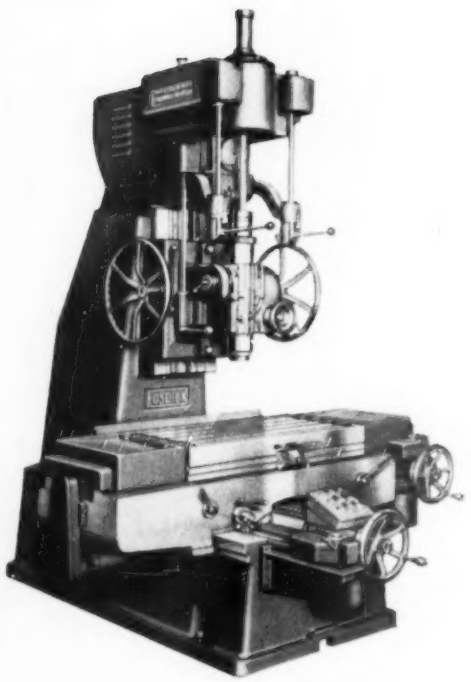
Exclusive with Fosdick, the Sensitive Radial combines upright and sensitive features—rigidity, compactness and convenient table height—with the capacity and flexibility of a radial. Table is universally adjustable, arm rotates at constant height and controls are always within convenient reach. One piece column, 3 and 4 ft. arms. Drills up to 1¼ ".

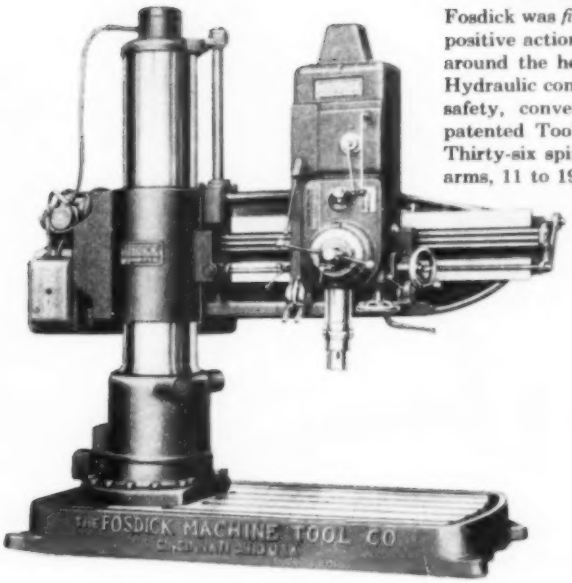
JIG BORER and AUTOMATIC POSITIONING MACHINE

Jig boring with automatic positioning has eliminated the need for highly-skilled labor for precision hole positioning! With duplicating bars—made quickly, stored easily—the ordinary operator can position table and slide at the same time to within plus or minus .0001" *at the touch of a button!* And Fosdick's Jig Borer costs less than any comparable machine on the market.

Duplicating drilled, bored and tapped parts—*weeks, months* or *years* apart—is fast, economical with Fosdick's Automatic Positioning machine. Set up time measured in minutes! Costly jigs are replaced by compact duplicating bars made of standard ⅝" stock, bored for each hole.

Table sizes: 18"x36" (no automatic positioning) and 22"x44". Table to spindle capacity, 27". 3 hp motor standard, 5 or 7½ hp optional.





ECONOMAX HYDRAULIC RADIAL DRILL

Fosdick was *first* to use hydraulics in a radial for smooth, positive action, easy operation. Controls are grouped around the head for maximum operator efficiency. Hydraulic controls and clamps are interlocked for safety, convenience. Standard equipment includes patented Tool Ejector and built-in fluorescent tube. Thirty-six spindle speeds, eighteen feeds. 3 to 8 ft. arms, 11 to 19 inch columns.

UPRIGHT DRILL

Two sizes, 25″ and 30″ with either round or box columns. Twelve spindle speeds from 60 to 1500 rpm, nine power feeds from .005″ to .043″ per revolution.

SENSITIVE DRILLS

For economical production of small drilled parts. 1 to 6 spindles in either six or nine speeds from as low as 55 rpm to as high as 3600 rpm, four power feeds.

Mail this coupon today!

FOSDICK

The Fosdick Machine Tool Co., Dept. A, Cincinnati 23

Please send descriptive bulletins for the following machines:

- ☐ *Sensitive Radial*
- ☐ *Economax Radial*
- ☐ *Jig Borer*
- ☐ *Automatic Positioning Machine*
- ☐ *Sensitive Drill*
- ☐ *Upright Drill*

Company

Address

Individual

Title

THE FOSDICK MACHINE TOOL CO., CINCINNATI 23, OHIO

Whose cheese is being divided?

TWO cats could not agree on fair division of a tasty cheese. "Let's go to the monkey," said one, "He is all-wise and can divide our cheese fairly." So to the monkey they went.

The monkey immediately broke the cheese evenly and judicially put the two pieces on the pans of his balance. But one was slightly heavier. He shrewdly nibbled that piece a bit and put it back on the scales. Now it was the lighter piece. So he bit off some of the other piece only to find it the lighter. Thus while the two hungry cats watched, the monkey kept taking bites of the cheese, first one piece, then the other, until finally the cheese had almost disappeared.

"What's left is too small to divide," sagely pronounced the monkey, as he popped the remaining fragments into his mouth.

Observers of the American scene see a direct parallel between the record of federal taxation and this ancient parable of the trusting cats, the greedy monkey and the cheese. Business and the individual citizen have been content to trust government to rule on the disposition of their earnings. And Uncle Sam keeps taking bite after bite out of the shares of both individual citizen and business.

Already government bites are so large as to severely penalize citizens and business alike. If allowed to continue, it will seriously impede further industrial progress and growth, stifle initiative and threaten the strength of our free enterprise system. Beware the day—goal of the socialists among us—when the monkey says, "What's left is too small to divide."

QUALITY YOUNGSTOWN SERVICE

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RAILROAD TRACK SPIKES - CONDUIT - HOT AND COLD FINISHED CARBON AND ALLOY BARS - PIPE AND TUBULAR PRODUCTS - WIRE - ELECTROLYTIC TIN PLATE - COKE TIN PLATE - RODS - SHEETS - PLATES.

HY-PRO SPECIALIZES IN PRODUCING TAPS!

...to Save You Time and Money

Yes, we do specialize in tap production. To be exact, it makes up the bulk of our output. And because of this, our engineer specialists—in fact, our entire organization—concentrate their efforts on the design and perfection of one important line—Hy-Pro Taps.

Whatever your tapping needs may be—from a special design problem to advice on your present production setup—these Hy-Pro Engineer specialists are ready to work closely with you.

Call us today for full information about Hy-Pro's services. We offer you a complete line of taps, and with it the know-how that only specialization in one field can produce.

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HY-PRO

HY-PRO TOOL CO., NEW BEDFORD, MASS., U.S.A.

The U. S. Steel Supply team that gives you *personalized service*

...your consultant on sound credit practices

MANY small or growing business concerns want to discuss from time to time sound financial practices and credit requirements in connection with steel supply purchases.

Your inquiries on such matters receive confidential, sympathetic consideration and prompt action from our Credit Manager in your district. His experience and help in establishing a sound credit policy are at your service whenever you need them. The man to contact for quick results on your request for credit arrangements is your U. S. Steel Supply salesman.

He is also the man to call for information about the availability and suitability of steel, tools, equipment and machinery for your specific production needs. Call him anytime! He will see that all the personalized services of U. S. Steel Supply are put to work as needed to improve your business.

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USS

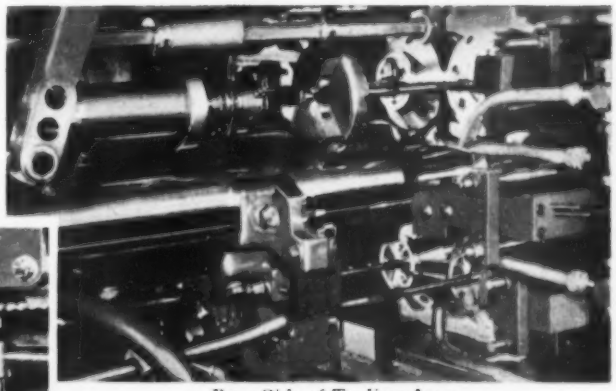
UNITED STATES STEEL

Although certain types of shaft jobs offer natural opportunity as bar machine work, with the exception of the CONOMATIC, seldom do they appear on multiple spindle bar automatics. In general, shaft jobs require a longer tooling area than do other types of bar work.

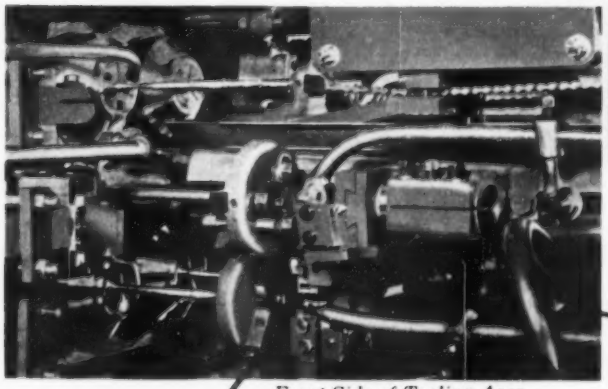
A glance at the frame design of the CONOMATIC explains why its tooling area is longer* than the tooling areas of other "automatics." And there are more tool positions* and more room* for tool setting for *any* type of job.

*You can have the figures

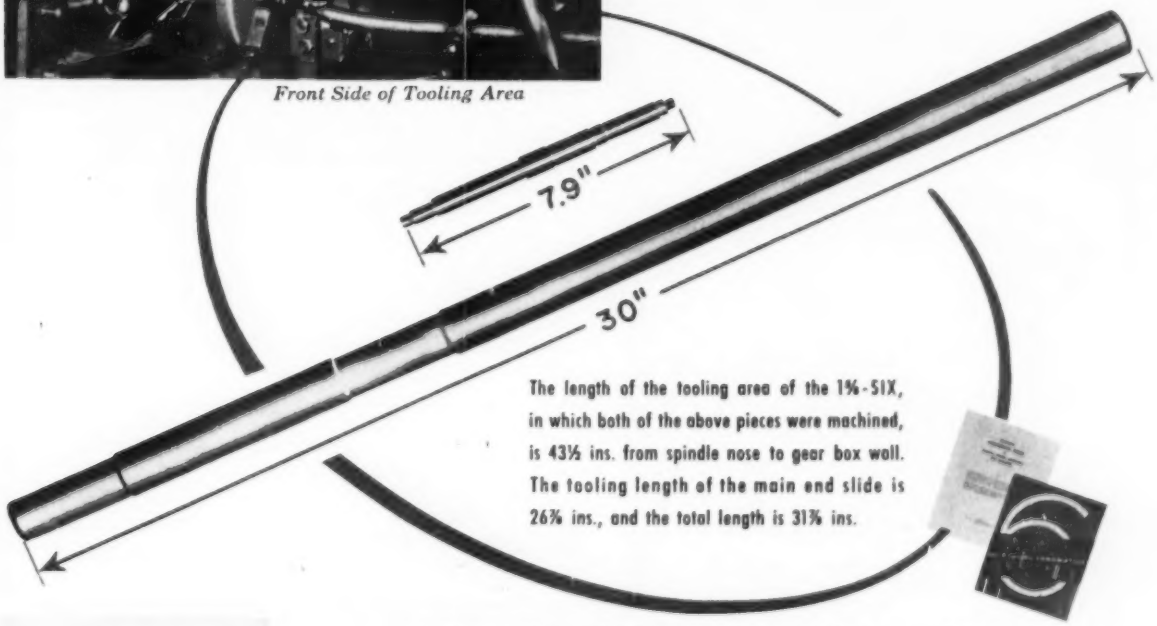
THERE'S *More* THAN JUST *"Elbow Room"*



Rear Side of Tooling Area

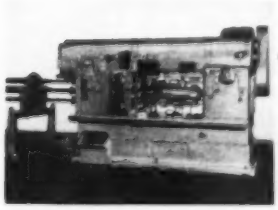


Front Side of Tooling Area



The length of the tooling area of the 1¾-SIX, in which both of the above pieces were machined, is 43½ ins. from spindle nose to gear box wall. The tooling length of the main end slide is 26⅞ ins., and the total length is 31⅜ ins.

A Comparison of ALL Automatics is in favor of Cone



Conomatic } CONE AUTOMATIC MACHINE COMPANY, INC. WINDSOR, VT., U.S.A.

A GOLD MINE OF

Job-Proved, Cost-Cutting, Production Helps

Methods and Production Case Records on a wide range of actual operations

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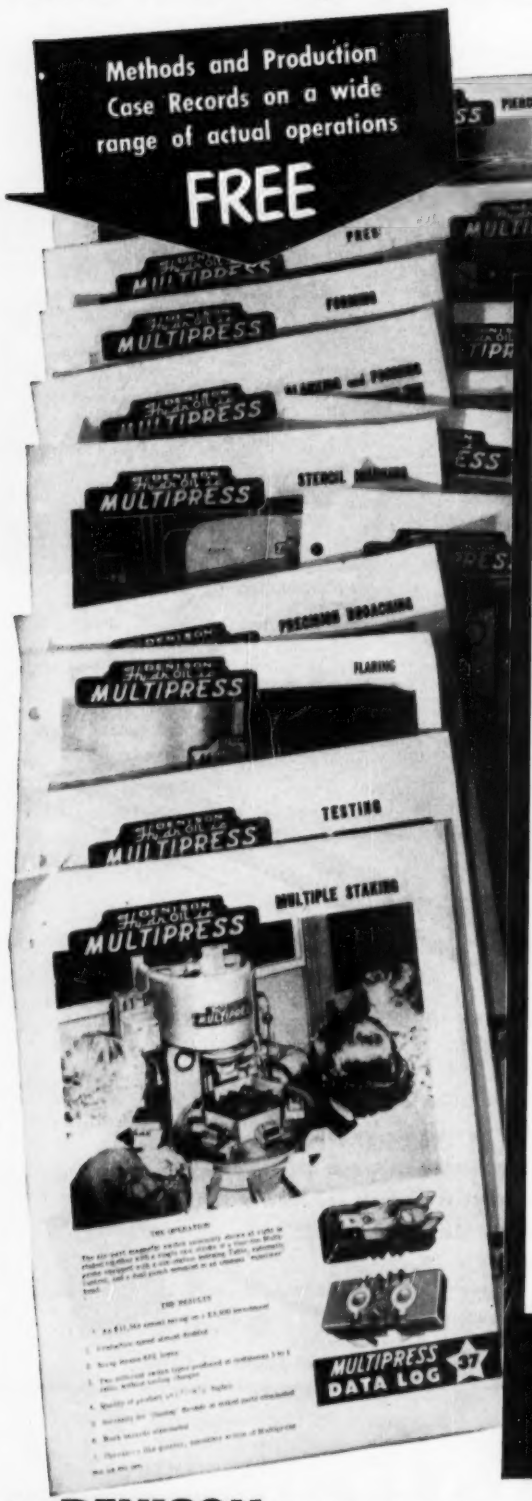

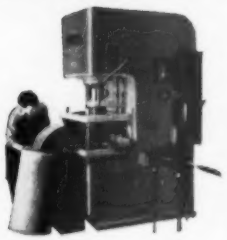

See how *others* cut costs with

MULTIPRESS®

Facts and figures from hundreds of actual users tell *how* and *why* the smooth oil-hydraulic power and control of Multipress cuts production costs. Our Data Log reports on these applications may offer better answers to some of your own production needs.

Multipress offers complete adjustability of ram speed, pressure and stroke length.

Pressures build up instantly as the ram contacts the work . . . there's no hammer-blow impact on work or tooling.

With Multipress Index Table Feeds, work can be loaded on multiple fixtures that index to the press ram automatically at speeds up to 70 per minute — often keeping two or more operators busy at top speed.

Automatic time delay, for ram dwell or hold-down, is easily provided with Multipress.

Many other types of valving, ram controls, auxiliary feeds, operating accessories and tooling attachments can be interlocked with the Multipress ram action. Let us send you full details on Multipress.

Write Today for Data Logs on types of operations your production requires.

DENISON Hydr**OIL**ics

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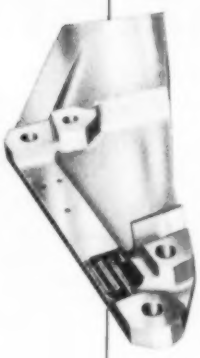
The DENISON Engineering Company **1164 Dublin Road, Columbus 16, Ohio**

where *Precision* counts

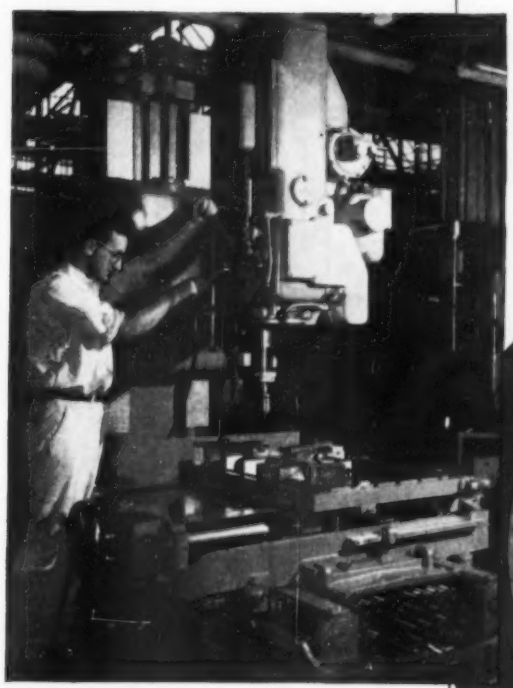


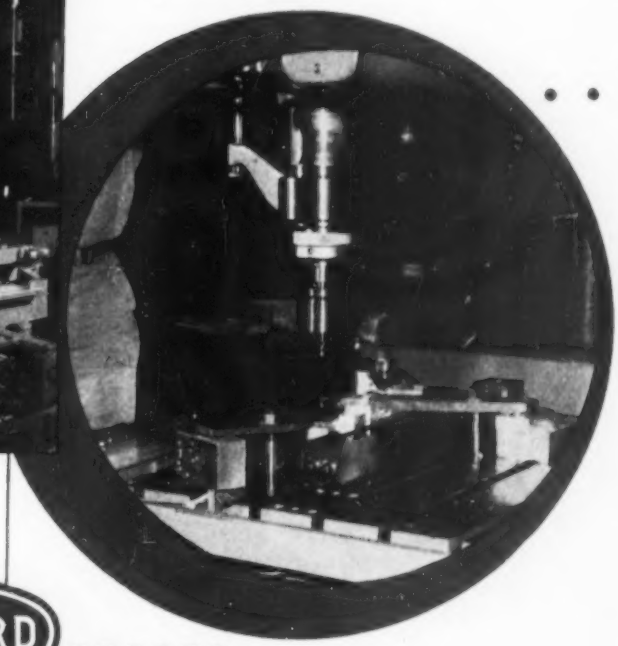
a natural combination hard to beat . . .

Bullard 30 x 20 Spacing Table installed on Cincinnati-Bickford fixed arm Precision Drilling Machine at Convair (Consolidated Vultee Aircraft Corporation, San Diego, California) is proving that these two units "pay-off" in elimination of jig cost, speeding-up production and accuracy in repetitive drilling on a variety of work.

A new job goes into immediate production with no lost time — no waiting for preparation of jigs.

Simple and comparatively fast change-over from one job to another minimizes production tie-ups.





Precision work materially reduces if not entirely eliminating spoilage and provides complete interchangeability of parts.

BULLARD SPACER

Ask for information on Precision Drilling without Jigs

. . . THE BULLARD COMPANY . . . . .

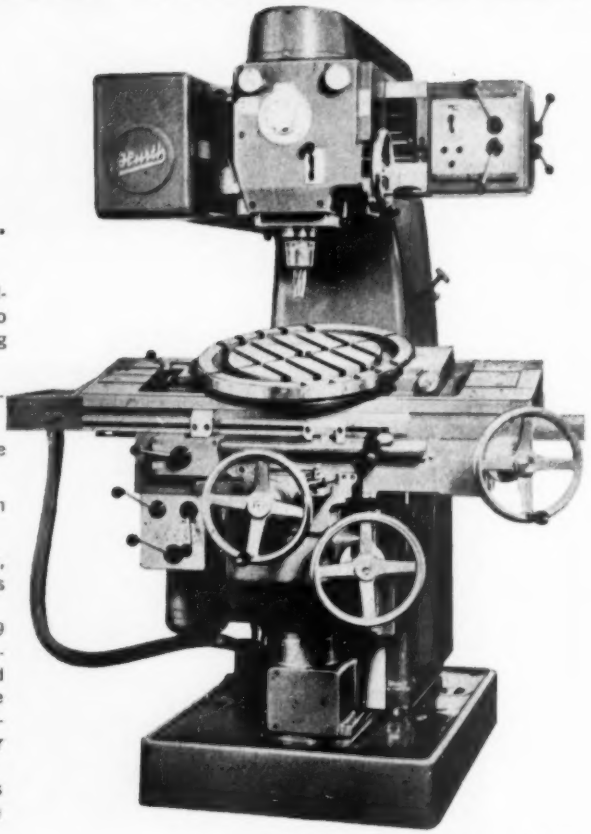
BRIDGEPORT 2 • CONNECTICUT

3 in 1 machine tool

combines vertical milling, downfeed milling and jig boring

now available

for prompt delivery...



HURTH V 10a—Boring and Milling Machine with 19¾" swivel table in position on worktable. Worktable area is 11¾" x 39¼".

In one set-up of the work, the HURTH Precision Boring and Milling Machine performs three different machining operations to close tolerances—you merely change table settings and cutting tools for—

VERTICAL MILLING—using the longitudinal traverse of the worktable, which can be tilted 15° to front or rear.

DOWNFEED MILLING—using the longitudinal traverse of the worktable and graduated downfeed of the cutting spindle.

JIG BORING—using the continuous spindle downfeed, which can be varied in extremely small steps.

Specifically designed for precision machining of jigs, fixtures, molds, dies, gages and similar close-limit tooling, the HURTH is equally adaptable for small-lot and long-run production work.

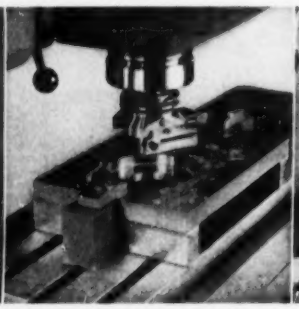
13 spindle speeds cover the range from 45 to 2,800 rpm. 9 boring speeds are available for each of the spindle speeds. Precision cutting is assured by the extremely long spindle quill guided in a precision-bored hole, with a double-row roller bearing in the spindle head maintaining a true running spindle. The rugged construction of the machine virtually eliminates distortion under load.

Gage block measuring equipment on the worktable enables operator to accurately check the work while it remains in position in the machine.

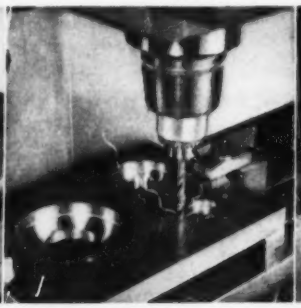
The HURTH 3-in-1 machine will cut costs as fast as it cuts chips... in your toolroom or on your production line. Write for literature and complete specifications.

Engineered servicing from Orban Service Centers in Cleveland, Detroit, Newark. Stock parts from Cleveland.

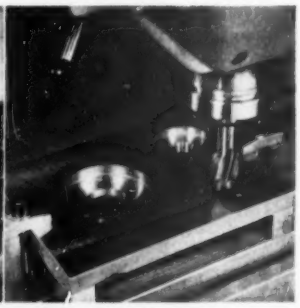
***MACHINING A BULKY WORKPIECE** held on the tilting table. Note deep throat of machine.*



***BORING AND FACING** operations, using a boring and facing head.*



***DRILLING** holes for drill jig bushings.*

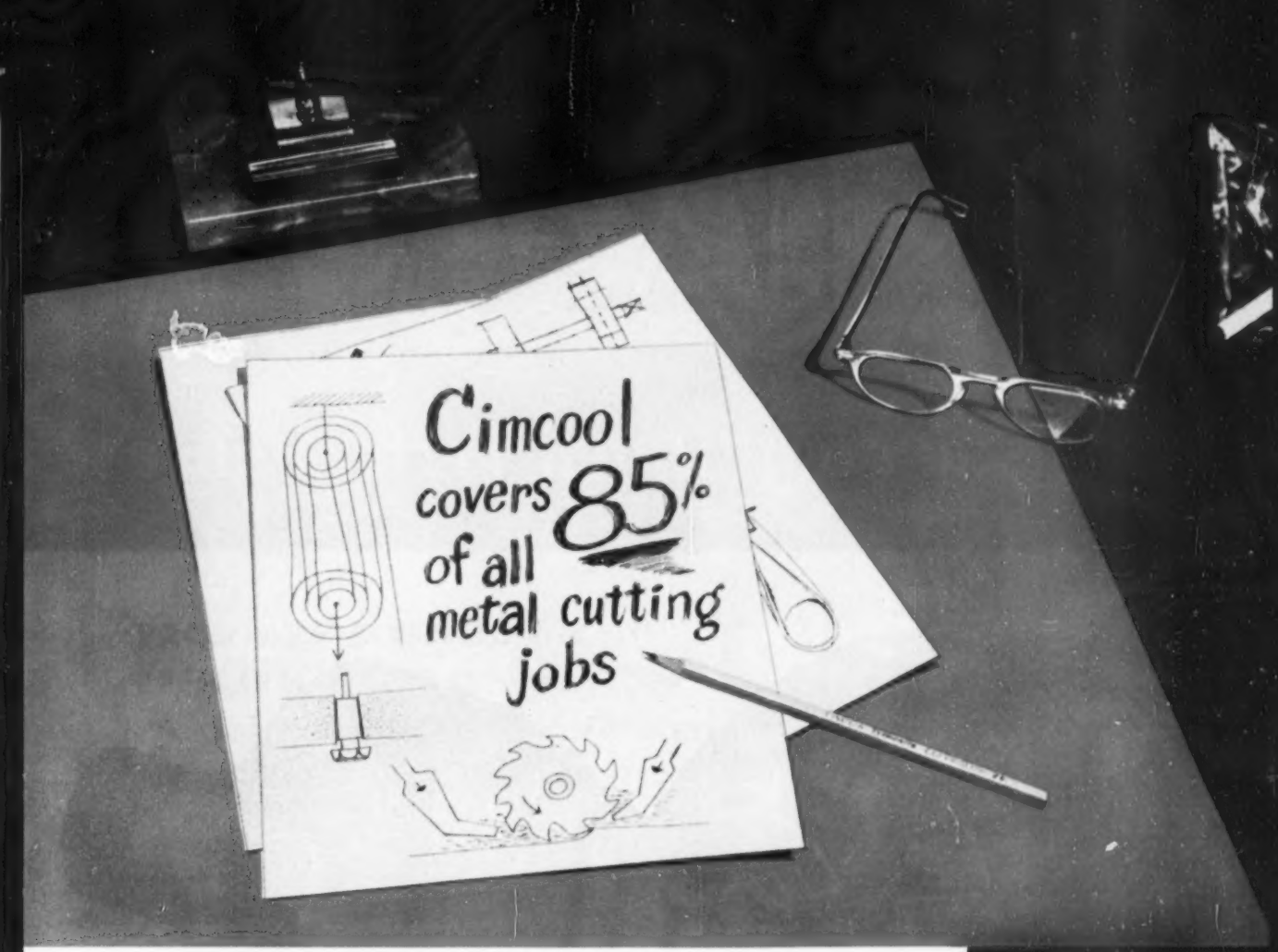


***JIG BORING** holes, previously drilled in the HURTH machine.*

KO CO., INC. INDUSTRIAL IMPORTERS

KURT ORBAN COMPANY, INC.

205 East 42nd St., New York 17 • 4220 Prospect Ave., Cleveland 3 • 19450 James Couzens Highway, Detroit 35
1939 Santa Fe Ave., Los Angeles



... and does a better job!

JOT THIS DOWN, TOO: Cimcool° is the radically new and different cutting fluid that also lowers costs . . . permits faster speeds . . . increases accuracy . . . helps increase tool life.

Cimcool is superior to old-fashioned coolants because it is a chemical emulsion. It replaces all water emulsions and all but a few highly compounded specialty oils. Cimcool permits faster speeds and increases tool life because it combines friction reduction and cooling capacity in a degree never before attained. It's longer lasting in machines. So Cimcool reduces downtime and cuts labor costs for cleaning and changing.

For a demonstration in one of your own machines, just write us and we'll have one of our Cincinnati Milling-trained machinists call on you—without cost or obligation. Or, if you prefer, write for our free booklet, "CIMCOOL Defeats Heat." Address Sales Manager, Cincinnati Milling Products Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

°Trade Mark Reg. U.S. Pat. Off.

A Production-Proved Product of
THE CINCINNATI MILLING MACHINE CO.

for 85%
OF ALL METAL CUTTING JOBS

NIAGARA

Outstanding Clutch Performance

Available on Niagara Geared

INCLINABLE PRESSES
HORN PRESSES
DEEP THROAT PRESSES
STRAIGHTSIDE PRESSES
GAP FRAME PRESSES

NIAGARA MACHINE & TOOL WORKS • BUFFALO 11, N. Y.

Electrically Controlled Air Actuated
SLEEVE CLUTCH

PROVIDES ECONOMY AND EFFICIENCY OF OPERATION
for presses with high frequency clutch engagement

ASSURES POSITIVE DRIVE, no slippage.

HAS NO FRICTION SURFACES to heat up or wear.

IS SMALL IN DIAMETER and therefore has low inertia, thus minimizing power lost in starting and stopping.

RUNS IN A BATH OF OIL to reduce wear.

HAS LOW AIR CONSUMPTION which reduces operating costs.

LOCATED AT END OF SHAFT so that it can be quickly and easily disassembled for inspection and servicing without removing clutch gear.

HAS FEW MOVING PARTS . . . integral jaws and splines resulting in reduced maintenance costs.

HAS SINGLE SOLENOID VALVE to control air flow to both clutch and brake, preventing overlap of clutch and brake action, a distinct possibility when separate solenoid valves are used.

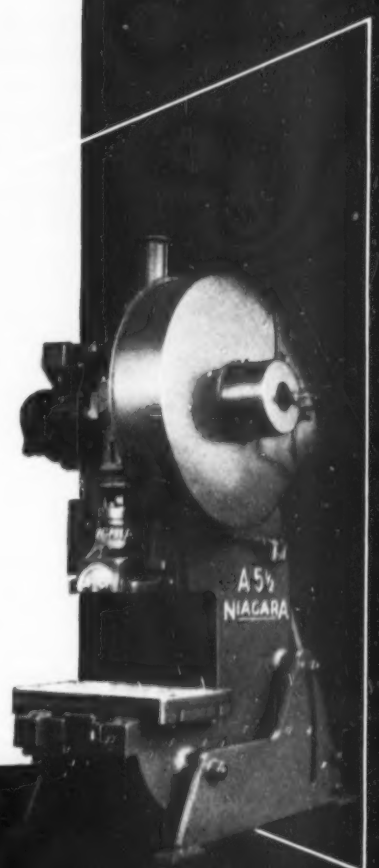
PROVIDES EFFORTLESS OPERATION with palm button or foot switch.

PROVIDES INSTANT ENGAGEMENT OR DISENGAGEMENT at any point in the stroke.

CAN BE SINGLE STROKED, JOGGED or operated continuously.

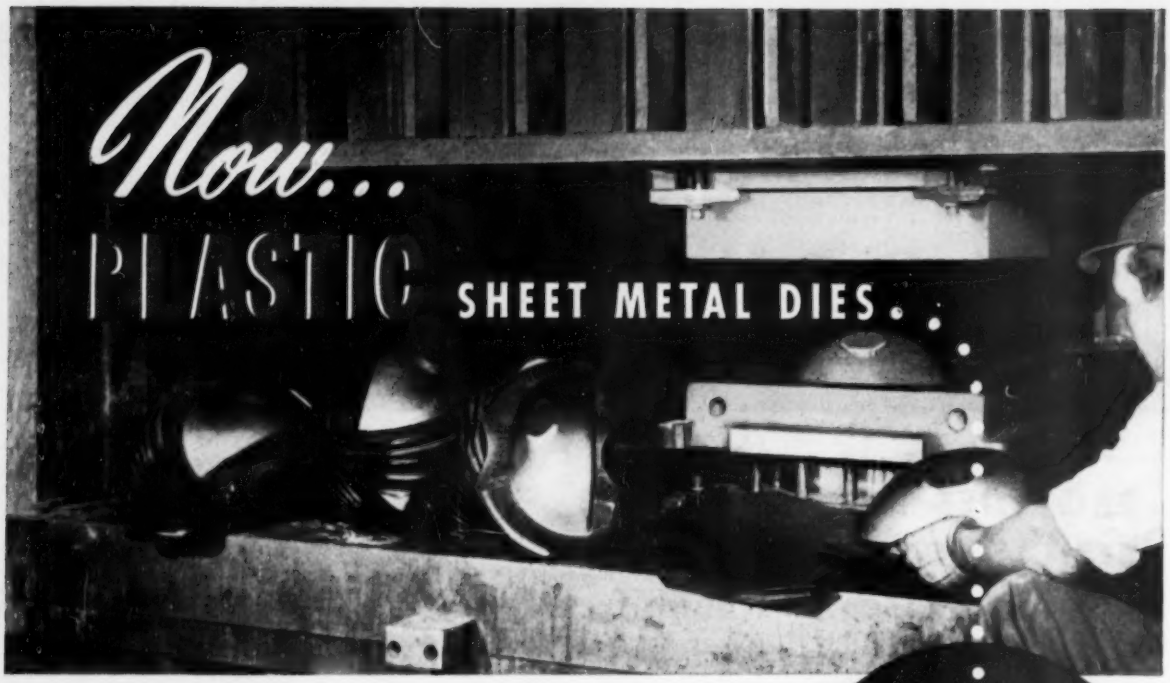
CAN BE STOPPED INSTANTLY by stop button, electric eye, limit switch or similar device.

STOPS AUTOMATICALLY if electric current or air pressure fails, an important safety feature.



Manufacturers of Presses, Shears, Machines and Tools for Plate and Sheet Metal Work

DISTRICT OFFICES: DETROIT • CLEVELAND • NEW YORK • PHILADELPHIA



To meet the need for lowest-cost short run dies which can be produced quickly and accurately, Richard Brothers Division is now equipped to supply plastic dies.

Rezolin tool plastic material, which has proved to have good wearing qualities and stability, is being used for these dies. Because this material does not expand or shrink, dies can be made to extreme accuracy and with a minimum of final fitting and tryout. On short run production such as that illustrated—experimental flywheel housing covers of 20 gauge steel—the use of plastic dies results in definite savings both in initial cost and time required for delivery.

With the addition of the equipment and specially trained personnel required to produce plastic dies, Richard Brothers Division is now in a position to supply sheet metal dies exactly suited to any production requirement. Allite zinc alloy dies meet the needs for experimental or short run work where quantities exceed the limitations of plastic dies. For high production runs, iron dies of every type and size can be built. In many cases, combinations of materials can be utilized to provide maximum economy without sacrifice in die performance.

The best sheet metal die for the purpose . . . the most economical die for the purpose . . . can always be built for you by Richard Brothers Division. Write us for full details.

Remember us for

COMPLETE

SHEET METAL DIE SERVICE

Other Allied Products

HARDENED AND PRECISION GROUND PARTS • SPECIAL COLD FORGED PARTS • STANDARD CAP SCREWS JIGS • FIXTURES • R-B INTERCHANGEABLE PUNCHES AND DIES

PRECISION • EXPERIENCE • DEPENDABILITY

ALLIED PRODUCTS CORPORATION

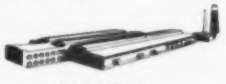
ALLIED PRODUCTS CORPORATION

DEPT. D-10 • 12605 BURT ROAD • DETROIT 23, MICH.

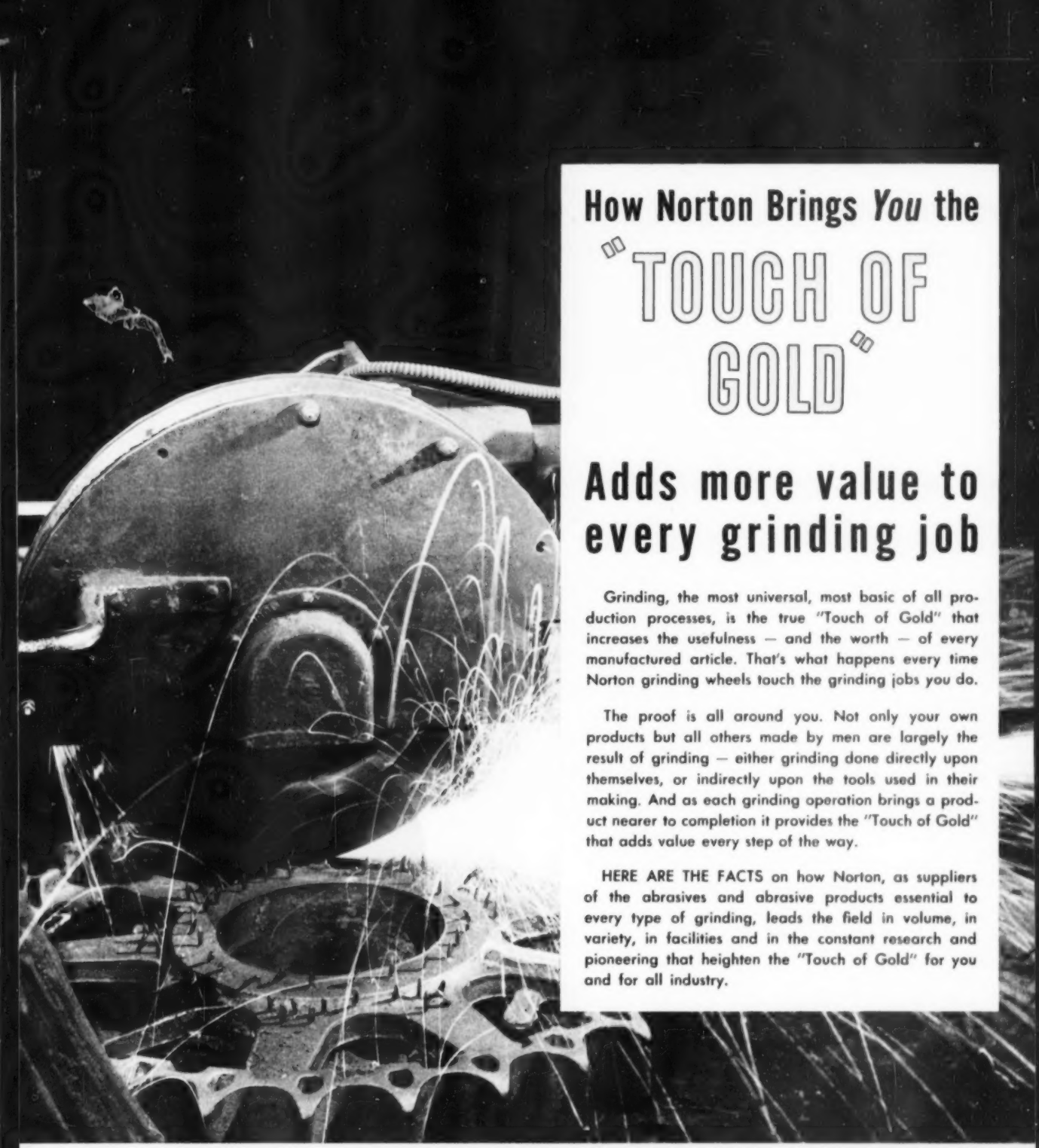
PLANT 1
Detroit, Mich.

PLANT 2
Detroit, Mich.

PLANT 3
Hillsdale, Mich.



PLANT 4
Hillsdale, Mich.



How Norton Brings *You* the "TOUCH OF GOLD"

Adds more value to every grinding job

Grinding, the most universal, most basic of all production processes, is the true "Touch of Gold" that increases the usefulness — and the worth — of every manufactured article. That's what happens every time Norton grinding wheels touch the grinding jobs you do.

The proof is all around you. Not only your own products but all others made by men are largely the result of grinding — either grinding done directly upon themselves, or indirectly upon the tools used in their making. And as each grinding operation brings a product nearer to completion it provides the "Touch of Gold" that adds value every step of the way.

HERE ARE THE FACTS on how Norton, as suppliers of the abrasives and abrasive products essential to every type of grinding, leads the field in volume, in variety, in facilities and in the constant research and pioneering that heighten the "Touch of Gold" for you and for all industry.

NORTON
ABRASIVES

Making better products to make other products better

"NORTON CITY"

World Headquarters for your

TOUCH OF GOLD

in Grinding

FIRST IN SIZE At "Norton City", the world's largest, most modern abrasive manufacturing center, you'll find over a mile of buildings and thousands of skilled workers. This big, bustling community ships out more abrasives and abrasive products, to all parts of the globe, than any other single source. Here also is located the newest and finest grinding machine plant ever built. And here, at the famous Norton School of Grinding, a constant stream of men — including many customers' employees — receive valuable instruction in every type of grinding wheel application.

FIRST IN RESEARCH Research is the guiding spirit at Norton. Over 100 trained scientists and technicians, in 19 specialized laboratories, are constantly exploring every phase of abrasive product improvement and application. For the "Touch of Gold" that will solve your own grinding difficulties, look to the organization that leads all others in the number and value of original developments. Look to Norton!

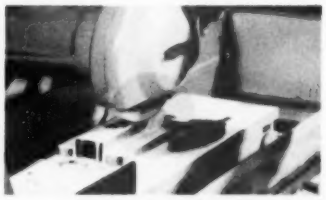
FROM NORTON RESEARCHES LIKE THESE... COME "TOUCH OF GOLD" EXCLUSIVES LIKE THESE

Abrasives and Bonds are microscopically examined under both plain and polarized light, in the Petrographic Laboratory.

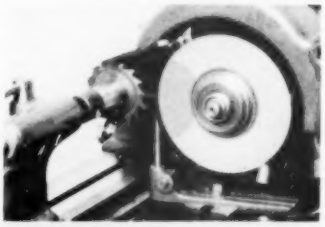
Musical Pitch, or "ring" of a wheel is measured in the Physical Chemistry Laboratory, to determine certain characteristics.

Constant Checking and testing of raw materials is one of the important functions of the Analytical Laboratory.

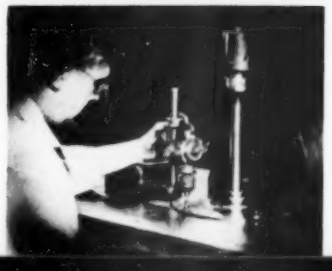
Norton New-Process Wheels are unequalled for uniform structure, identical performance and long, even wear.

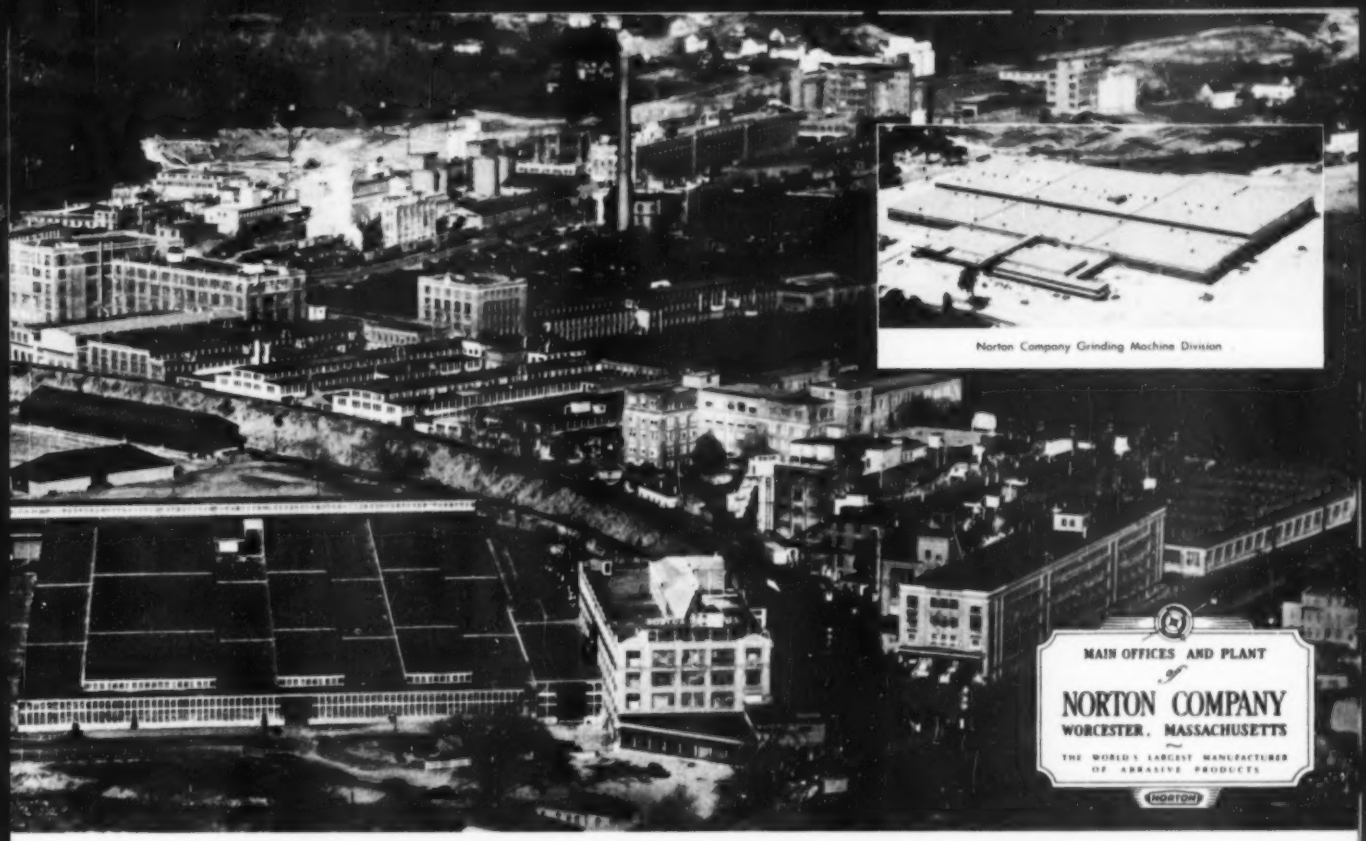


32 ALUNDUM* Abrasive is a revolutionary Norton advancement. 32 ALUNDUM wheels cut both faster and cooler.



NORBIDE* Abrasive, hardest man-made material, replaces diamond dust in many lapping jobs, at fractional cost.





FIRST IN PRODUCT VOLUME AND VARIETY

More Products for Better Grinding . . . More Grinding at Lower Cost

Norton offers you the widest choice of abrasive products — all manufactured to strictest quality control standards — the quickest, surest way to the grinding results you want. Norton ALUNDUM abrasives and Norton CRYSTOLON* abrasives, together with Norton-developed bonds, make available hundreds of thousands of different grinding combinations, covering every known grinding requirement.

That's why you can always count on getting the *right* Norton wheels for every grinding job you do.

Make Sure
YOUR Grinding
Gets the Top
Value-Adding

"TOUCH OF GOLD"

with Norton Abrasive Products

For: Rough Grinding • Surface Grinding • O. D. Grinding • Cutting-Off • Polishing and Lapping • Tool and Cutter Grinding • Internal Grinding • Disc Grinding • Die and Mold Grinding • Barrel Tumbling

NORTON ABRASIVES

Making better products to make other products better

*Trade-Marks Reg. U. S. Pat. Off. and Foreign Countries

and NORTON is FIRST in SERVICE, TOO

You've read how Norton makes exactly the wheels you need to put the cost-cutting, value-adding "Touch of Gold" into your grinding.

Here's how you can be sure of getting those wheels — whenever you want them, wherever you're located.

1. YOUR NORTON ABRASIVE ENGINEER is located conveniently near you. He's a trained technician, skilled in every detail of grinding wheel manufacture and application. And he's ready to go into your plant, study your grinding problems and help you find the money-making answers.

2. YOUR NORTON DISTRIBUTOR is your local, direct connecting link with the entire Norton organization. A topnotch, factory-trained grinding wheel man, with plenty of practical experience in everyday grinding problems, can give you valuable help in selecting the right Norton wheels. And you can always count on your Norton distributor for adequate stocks, selected to meet the particular needs of your area.

3. NORTON BRANCH WAREHOUSES located in Chicago, Cleveland, Detroit, Philadelphia, and Pittsburgh, are backed by the huge stocks at Worcester. Each of these stocks is a vital nerve center in the Norton distribution system — each is an additional guarantee that Norton Service matches Norton Engineering in bringing you the "Touch of Gold" that means more profitable grinding for you.

NORTON COMPANY

Worcester 6, Massachusetts

DISTRIBUTORS IN ALL PRINCIPAL CITIES
SEE YOUR CLASSIFIED TELEPHONE DIRECTORY

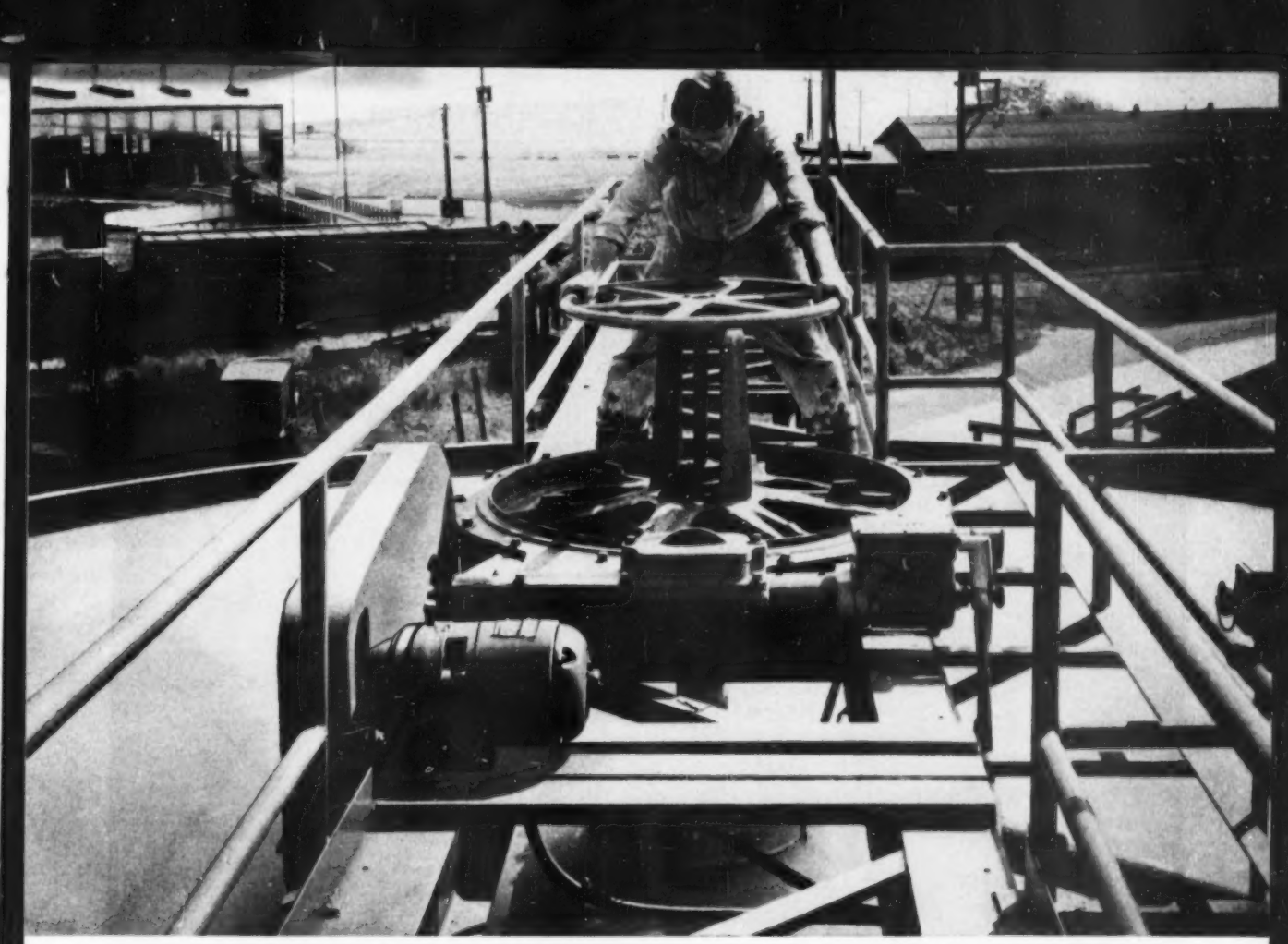
EXPORT: Norton Behr-Manning Overseas Inc., Worcester 6, Mass.

NORTON
ABRASIVES

Making better products to make other products better

12-52

Printed in U.S.A.



THIS G-E GEAR-MOTOR WAS PICKED TO RUN A SLUDGE ACCUMULATOR 24 HOURS A DAY AND 7 DAYS A WEEK BECAUSE . . .

New G-E Gear-motor Reduces "Down-time"

Easy stator removal, use of Tri-Clad* motors, cuts maintenance costs and time more than 50%.

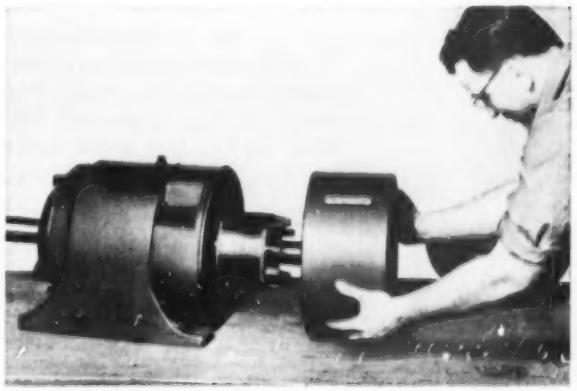
G-E Gear-motors are single units—compact and efficient—the most economical method of gear reduction for low-speed drives. This year, they have been redesigned to offer you additional operating economy.

EASY STATOR REMOVAL is now possible without disturbing the gear-train in any way. Also, any standard G-E motor—with or without feet—may be used as a stator replacement. These advantages mean a reduction of non-productive "down-time"—and substantial cost savings!

TRI-CLAD MOTORS are now an integral part of every G-E Gear-motor. These are the same motors which have gained such a wide acceptance throughout industry—the motors which assure you of extra reliability—triple protection against physical damage, electrical breakdown, and operating wear and tear.

A new stocking plan keeps most popular ratings available on a 1-week basis. You can order your gear-motor from your nearest G-E Apparatus Sales Office or your Authorized G-E Agent or Distributor. General Electric Company, Schenectady 5, N. Y. 755-10

Registered Trade-mark of General Electric Company



Rabbet fit between stator and gear-motor frame assures positive realignment. Note that stator removal is simply a matter of removing a few bolts—can be done without disturbing gear-train.

GENERAL ELECTRIC

Takes on all comers!

This 42-72-84 Blanchard Surface Grinder is used for machining many sizes of torch cut steel plates. As the first operation after cutting, Blanchard grinding removes the proper depth of stock as required, frequently up to ⅛" per side, producing surfaces accurately flat and parallel for laying out or further machining. Work up to 7 feet across corners is regularly ground on this machine. In spite of its size, this grinder is as easily controlled as the smaller Blanchard grinders.

Typical of work produced is the 48" x 48" x 10" machine steel, die mounting plate, at left. 58 cu. in. of stock (.025" per side) is ground off in one hour and 35 minutes, floor to floor, with flatness held to .001". Note the magnetic hoist —a good tip for loading and unloading the Blanchard quickly.

Regardless of your requirements for stock removal, tolerances or surface finish, Blanchard has the grinder and grinding wheel to do each job best.

Send for your free copies of "Work Done on the Blanchard," fourth edition, and "Art of Blanchard Surface Grinding."

PUT IT ON THE BLANCHARD

THE BLANCHARD MACHINE COMPANY

64 STATE ST., CAMBRIDGE 39, MASS., U.S.A.

This Installation sold by Industrial Sales Co. of Washington, D. C.
Branches in Baltimore, Philadelphia, Chicago and Greensboro, N. C.

The above illustration shows four of a battery of 11 Wysong power squaring shears in the production line at *The Glenn L. Martin Company,* world famous manufacturers of aircraft. The four shears illustrated are Wysong No. 748 with a capacity of 3/16 inch mild steel and a cutting length of 48 inches.

Like *The Glenn L. Martin Company,* many nationally known firms are using Wysong shears in producing articles for defense, for transporation, and for use in daily life. The rigid construction from Hi-tensile castings gives Wysong shears a long life of accurate shearing. Precision gauges make positioning of stock quick and easy.

Wysong builds 24 different models of power squaring shears with capacities up to 1/4 inch mild steel, in cutting lengths up to 12 feet. There is a size to fit your needs.

Wysong also builds Air Power and Foot Power Squaring Shears in capacities of 18 and 16 gauge mild steel, in cutting lengths from 36 inches to 10 feet; O.B.I. Presses; Slip Roll Forming Machines; and Rotary Combination Machines. See your dealer or write to the factory for full information.

NATIONAL MACHINE TOOL BUILDERS ASSN. MEMBER

Wysong & Miles Company, Greensboro, N. C.

WYSONG

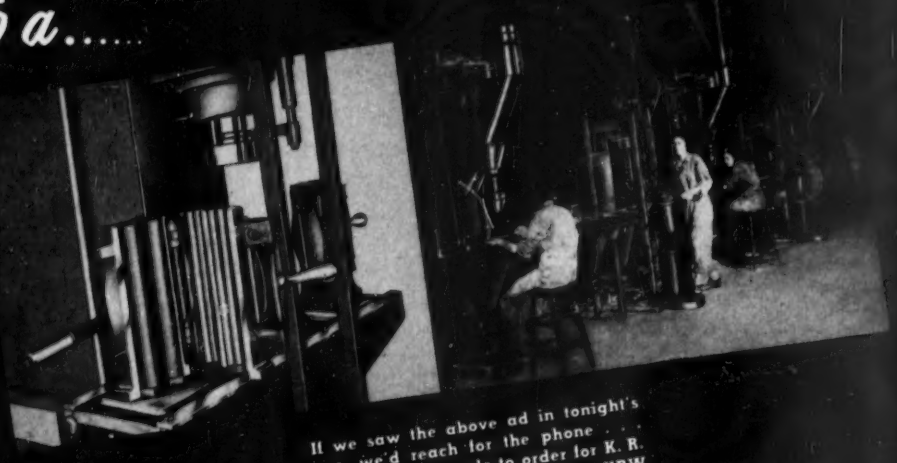
This ad....

Help Wanted

COMPANY to design and build shell loading hydraulic presses. Must be fast, efficient and engineered for safety. World War II experience preferred.

DESIGNE... tool designers, draftsmen. ...established manufacture...

FITS KRW *to a.....*



If we saw the above ad in tonight's paper, we'd reach for the phone . . . quick! The job's made to order for K. R. Wilson. During World War II, KRW engineers designed a faster and safer method for loading shells and incendiary bombs. Hundreds of KRW 1-station, 2-station and 4-station shell loading presses were supplied to bomb loading contractors across the country. The photo at left above shows a close-up of the shell case holder on a KRW 4-station shell loader. At right is a battery of KRW presses working at top speed in one of the nation's largest arsenals.

K. R. Wilson is set to do an even bigger job today. Almost two million dollars in new machinery and equipment have been added to our plant since World War II. So if you have shell-loading contracts, write, wire or phone KRW for the right equipment. We can go to work on your order at a moment's notice.

Send for

FREE NEW BOOKLET

It tells all about our plant, equipment, facilities and experience in war and peacetime production. It's yours for the asking. Write Dept. H.

K R WILSON

215 Main St. • Buffalo 3, N. Y.

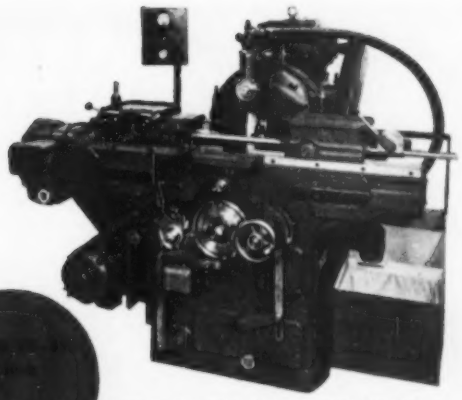
"Freedom is Everybody's Business!"

WE WANT TO MAKE IT OUR BUSINESS!

K R WILSON

Quality threading

AT MINIMUM COST



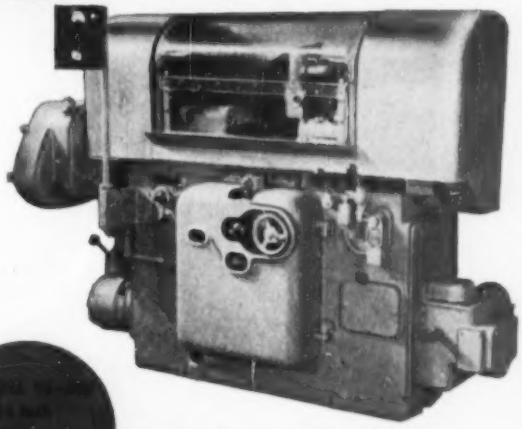
Automatic Thread Grinder is used for high n thread grinding with either single or multi- wheels on relatively small parts.

JONES & LAMSON
AUTOMATIC THREAD GRINDERS:

- Produce threads of better quality and more uniform finish
- Reduce handling cost
- Eliminate costly rethreading after heat treatment
- Eliminate expensive retooling when specifications change
- Reduce cost of gage maintenance

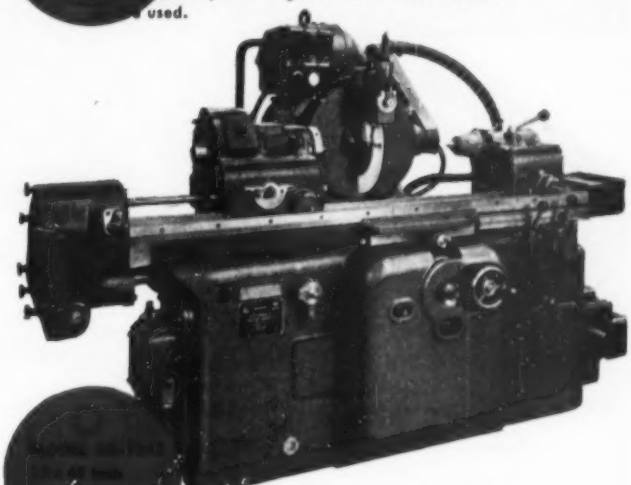
Built-in accuracy and automatic features, make any of these machines a paying investment for toolroom or production line.

- Automatic wheel truing
- Automatic infeed on successive cuts
- Automatic sizing
- Rheostat wheel speed control
- Diamond or crush dressing of wheels
- Multi-ribbed threading
- Right and left hand threading



achine is extremely versatile and is used short run jobs on a great variety of preci- aded parts. Single or multi-ribbed wheels used.

When measuring the value of a thread grinder remember the extra benefits of J & L top-flight construction. Write Dept. 710 for illustrated catalog.



achine is used for grinding threads on a e of work from small to large heavy parts. r multi-ribbed wheels can be used.

JONES & LAMSON

Machine Tool Craftsmen Since 1835

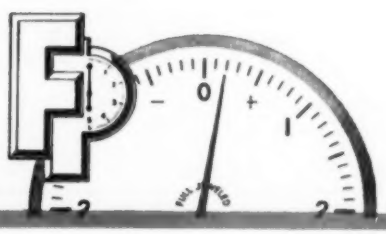
JONES & LAMSON MACHINE CO., 502 Clinton St., Dept. 710, Springfield, Vt., U.S.A. THREAD GRINDER DIVISION

ONLY DIMENSIONAIR

Approximately half actual size
Weight 17¾ lbs.

FEDERAL

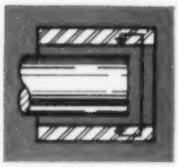
Largest manufacturer devoted exclusively to designing and manufacturing *all types* of DIMENSIONAL INDICATING GAGES



Gives You ALL This...

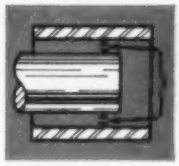
FULL 7½" SCALE OF CALIBRATED ACCURACY→

ALL OF IT measures accurately. Not just part of it!



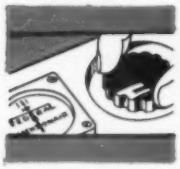
LONGER APPROACH RANGE

You begin to measure earlier BEFORE reaching minimum work size. Less scrap. Easier to insert plug. Same plug can be used on both rough and finished dimension. Total minus range .0015".



GREATER CLEARANCE — REGULARLY .0018" up to .0038"

You can read Undersize, Taper, Out-of-Round and Irregular Shape Holes without plug getting stuck. Easier to insert plug.



10 SECOND SET-UP — JUST ONE ADJUSTMENT

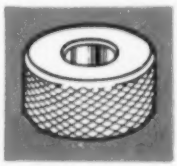
As simple as setting a Dial Indicator. Direct and Positive.

INTERCHANGEABLE PLUGS— WITHOUT MAJOR ADJUSTMENT

Every measuring plug calibrates on same scale.

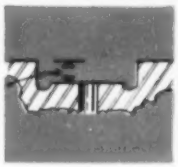
STAY-PUT ZERO — DON'T WORRY ABOUT PRESSURE FLUCTUATIONS

They do not affect accuracy. Set zero when you start—that's all. No drifting.



ONE MASTER ONLY — FORGET THE IDEA TWO ARE NEEDED

Only air gage built with enough precision to permit use of only one master. Just like any other precision instrument.



LONGER PLUG WEAR — JET FACES ARE DEEPER

Saves you real money.

MORE SENSITIVE — TO SIZE VARIATIONS

Fully Jeweled Cushioned Movement. Highly sensitive but rugged for shop use. Meter pointer cushioned at both ends of travel.

TRY IT— AND PROVE IT TO YOURSELF

The basic design of the Dimensionair is unique. It alone makes possible the many important features above. Customers who have first given the Dimensionair a thorough trial have found its advantages outstanding and have ordered many Dimensionairs in large quantities, and repeatedly. We invite you to try the Federal Dimensionair and compare it with any other air gage. Ask our nearest representative or mail the coupon today for complete information and prices. FEDERAL PRODUCTS CORPORATION, Providence 1, Rhode Island.

FEDERAL PRODUCTS CORPORATION
1121 Eddy Street, Providence 1, Rhode Island

I would like to have a demonstration of the Dimensionair. Please quote on Dimensionair and gaging plugs complete to gage hole shown on attached. (Send blueprint or sketch)

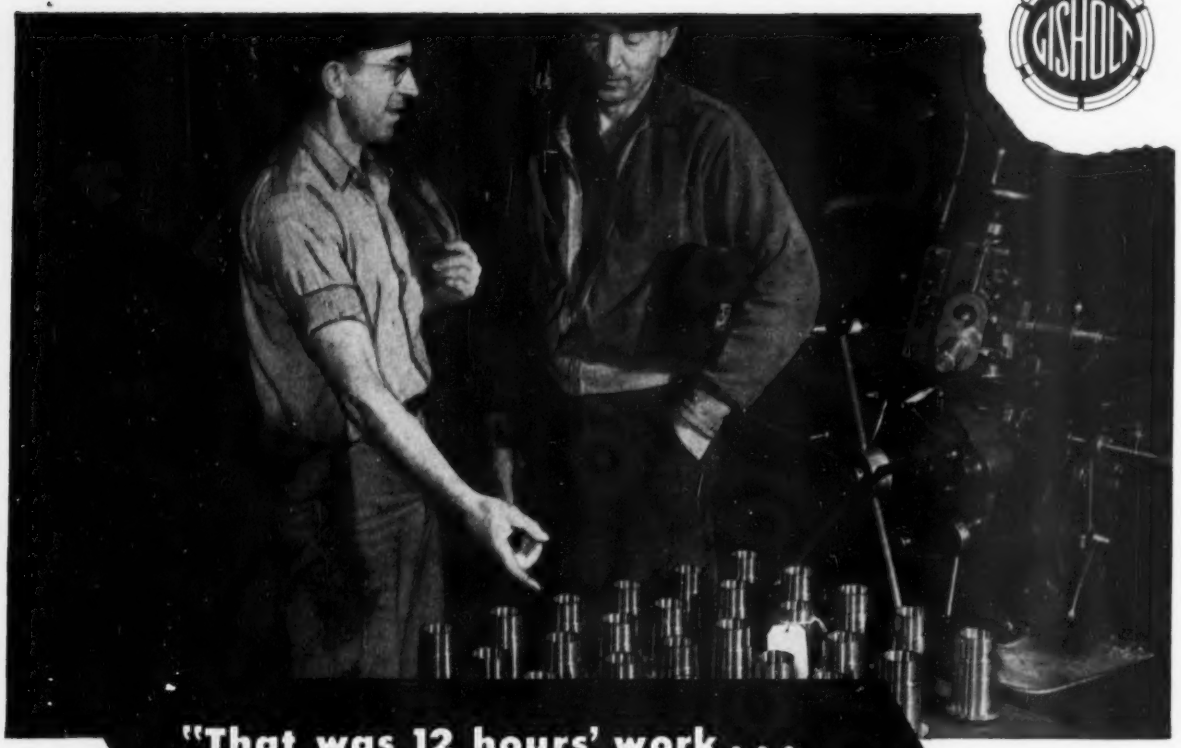
NAME .....

COMPANY .....

STREET .....

CITY .....

STATE .....



"That was 12 hours' work . . .

NOW WE DO IT IN 8!"

Yes, the operators who've struggled along with older turret lathes will tell you: A 50% increase in production is not unusual when you replace with new Gisholt Ram Type machines.

Many of the old manually operated functions have now become automatic. They're so much simpler and easier to run that you can't help but get more efficiency. Selective automatic speed changing gives instant changes between high and low spindle speeds. There's hydraulic clutching and braking—no effort. Automatic indexing and clamping of the hexagon turret saves more time. These are a few of the modern features that give you the smooth production rhythm that insures higher overall efficiency.

Add to these the power and rigidity to take multiple cuts and you have the unbeatable combination that means bigger production and lower costs. It's the performance that will "buy off" your older machines. Replace with modern Gisholt Turret Lathes.

THE GISHOLT ROUND TABLE *represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.*

GISHOLT MACHINE COMPANY

Madison 10, Wisconsin

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

Into your hands — fast. Prompt delivery of the twist drills you need is one of your Union Distributor's many helpful services.

FROM GIANTS TO MIDGETS, from 3.5" diameter down to .0135", Union twist drills cut fast, cool and free, with minimum breakage and more work between resharpenings. See your Union Distributor for the types and sizes that will help boost production and cut costs on every drilling job you do — on any material, with any type of drilling equipment.

FIRST TEAM IN CUTTING TOOLS . . .

UNION and your LOCAL DISTRIBUTOR

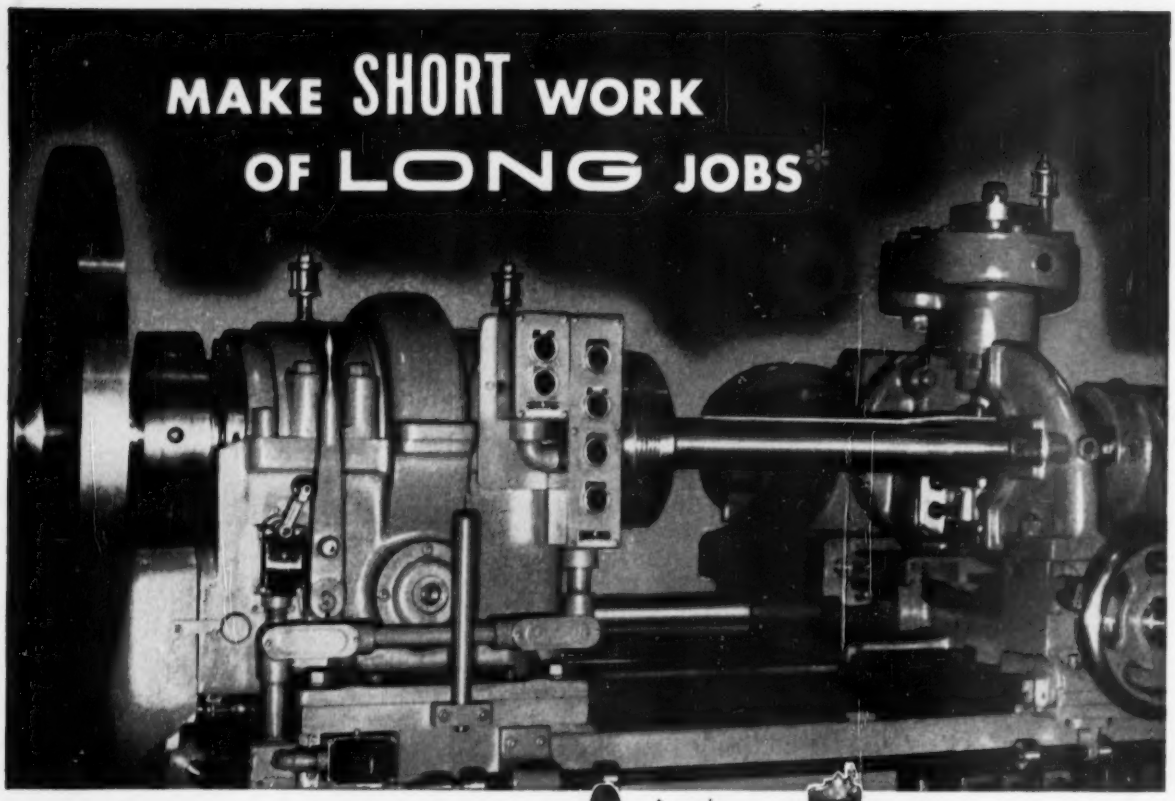
UNION TWIST DRILL COMPANY, ATHOL, MASSACHUSETTS • Milling Cutters • Gear Cutters • Twist Drills • Hobs • Reamers • Carbide Tools

We own and operate S. W. CARD MANUFACTURING CO. Division, Mansfield, Mass., Taps, Dies, Screw Plates

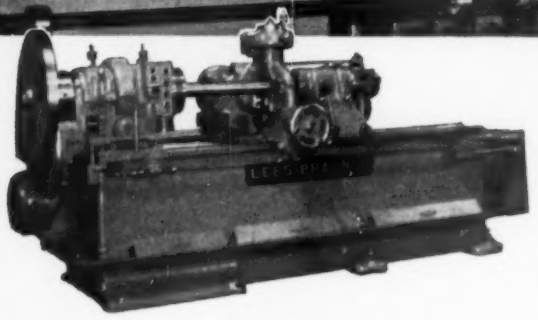
BUTTERFIELD DIVISION, Derby Line, Vt., Taps, Dies, Screw Plates, Reamers, Twist Drills

BUTTERFIELD DIVISION, Rock Island, Que., Milling Cutters, Twist Drills, Hobs, Reamers, Taps, Dies, Screw Plates

MAKE SHORT WORK OF LONG JOBS



with the Lees-Bradner *End Loading* SH SPLINE HOBBER



"The SH hobs splines up to 144".

The exclusive Lees-Bradner "feed through spindle" feature enables the SH spline hobber to handle long and bulky parts with maximum efficiency and speed. It also provides the necessary support for long splines of small diameter.

The SH will hob splines up to six inches in diameter and can handle spur and helical gears up to eight inches.

Let Lees-Bradner, the first name in hobbing, be your first thought when you have a hobbing problem. Your Lees-Bradner representative will be happy to consult with you without obligation.

the LEES-BRADNER Company

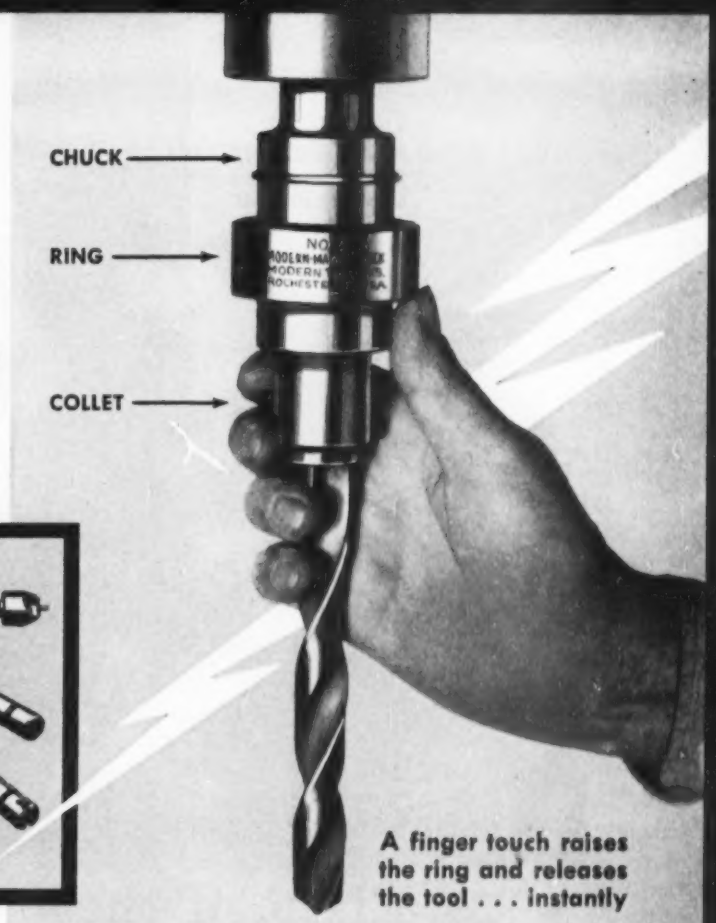
CLEVELAND 11, OHIO, U.S.A.

Speed up your production

Change tools without stopping . . . or even slowing the machine

MODERN-MAGIC QUICK CHANGE CHUCK and COLLET EQUIPMENT

A few examples of the many tools, shown with collets attached, driven by MODERN-MAGIC CHUCKS



A finger touch raises the ring and releases the tool . . . instantly

Modern Precision Tools Include . . . . .

- STATIONARY SELF-OPENING DIE HEADS
- ROTARY SELF-OPENING DIE HEADS
- STATIONARY COLLAPSIBLE TAPS
- ROTARY COLLAPSIBLE TAPS
- MODERN-MAGIC CHUCKS AND COLLETS
- SELF-OPENING STUD SETTERS
- INSERTED BLADE FACE MILLING CUTTERS
- SOLID ADJUSTABLE DIE HEADS
- ADJUSTABLE HOLLOW MILLING TOOLS
- UNIVERSAL CHASER GRINDING FIXTURES

Modern-Magic Quick Change Chuck and Collet Equipment virtually eliminates costly lost time of revolving spindle machines. Used with such machines, tools are changed without stopping or even slowing the spindle. Changes are made from drill to reamer to tap instantaneously and safely while the machine is running at cutting speed. In this way, the Modern-Magic Chuck and Collet Equipment gives multiple spindle range to single spindle machines, increasing production and cutting cost. In high production shops, it has been proved they save time even though used only for changing from dull to sharp tools.

For full information, send for Bulletin M-103. In addition to standard Modern-Magic Chucks and Collets, it shows special types of each.

Only the ORIGINAL Modern-Magic Chuck and Collet Equipment carry the name "MODERN-MAGIC" and are manufactured by Modern Tool Works, Rochester, N.Y.

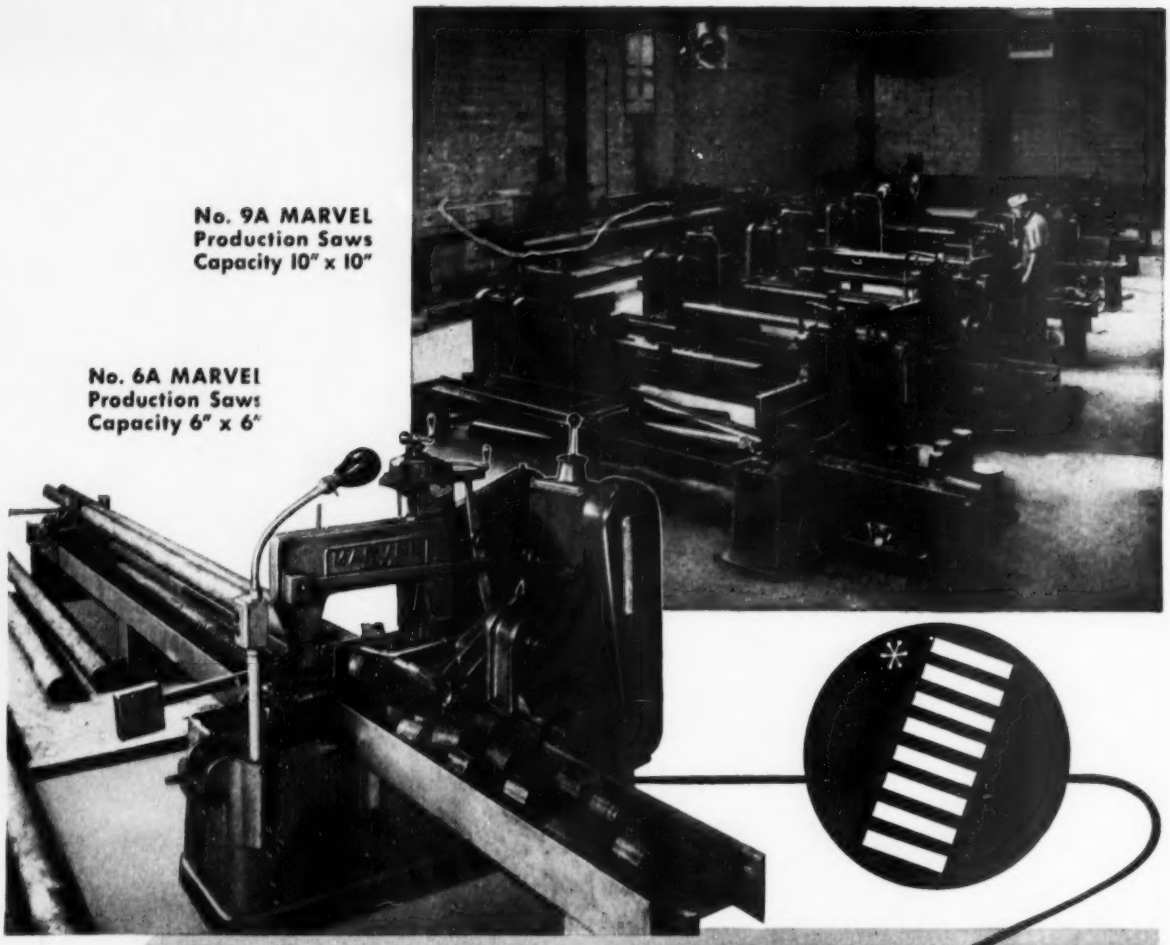
MODERN TOOL WORKS

DIVISION

CONSOLIDATED MACHINE TOOL CORPORATION

SUBSIDIARY OF FARREL-BIRMINGHAM COMPANY, INCORPORATED

ROCHESTER, NEW YORK



No. 9A MARVEL
Production Saws
Capacity 10" x 10"

No. 6A MARVEL
Production Saws
Capacity 6" x 6"

Eight of these MARVEL 9A Saws have already earned *Service Stripes**

Eight of these high speed MARVEL Production Sawing Machines at the Accuracy Steel Cutting Company, Hazel Park, Michigan, (a suburb of Detroit) operated almost continuously thruout the last war—cut up thousands of 20 ft. bars into accurate slices, pieces and lengths, for war production.

Now with a battery of fifteen of these world's fastest hack saws, Accuracy Steel Cutting Company has immense capacity to put behind defense and civilian work.

MARVEL Production Saws will automatically cut bar stock to size at terrific speed . . . they will feed, measure and accurately cut-off identical pieces from single or nested bars *automatically*, with no more operator attention than a battery of automatic screw machines.

Versatile, as well as accurate and fast, these saws can be stopped at any point in a production run—a miscellaneous cut made—and production resumed by simply re-engaging the automatic bar push up.

Write for Catalog

MARVEL *Metal Cutting* **SAWS**

Better Machines-Better Blades

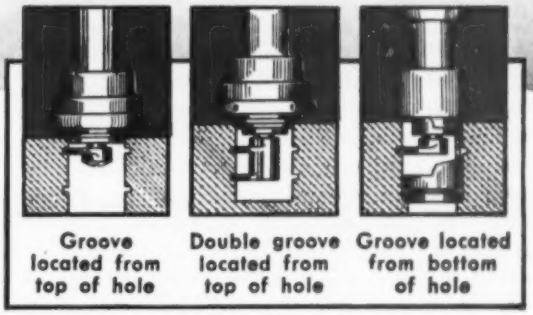
ARMSTRONG-BLUM MANUFACTURING CO.

5700 Bloomingdale Avenue *"The Hack Saw People"* **Chicago 39, U. S. A.**

Waldes Truarc Internal Grooving Tool

for precision cutting of internal grooves in bores and housings

FAST! ECONOMICAL! NEEDS NO SKILLED LABOR!



Groove located from top of hole | Double groove located from top of hole | Groove located from bottom of hole

Internal groove-cutting becomes the simplest of operations with Waldes Truarc Internal Grooving Tool. Easy to adjust—easy to operate...readily adaptable to individual requirements.

Designed for use in any hand drill or automatic drill press and screw machine... assures a concentric recess without injury to metal. Operates by fingertip pressure—especially suitable for unskilled operators.

The Waldes Truarc Grooving Tool when used in an electric or pneumatic hand drill, can be taken to the job eliminating disassembly and excessive handling...resulting in all-around savings in time and costs!

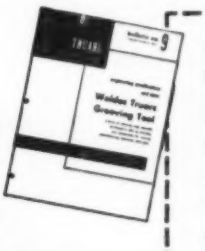
Write now for new 12-page Catalog giving mechanical details, cutting sizes...extra features...full information

WALDES

TRUARC

REG. U. S. PAT. OFF.

GROOVING TOOL



WALDES KOHINOOR, INC., 47-16 Austel Place, Long Island City 1, N.Y.
Waldes Truarc Grooving Tool
Manufactured under U. S. Pat. 2,411,426

Waldes Kohinoor, Inc., 47-16 Austel Place
Long Island City 1, New York AM-015

Please send me your new 12-page Catalog on Waldes Truarc Internal Grooving Tool.

Name_____

Title_____

Company_____

Business Address_____

City_____ **Zone**____ **State**_____

You save 2 ways

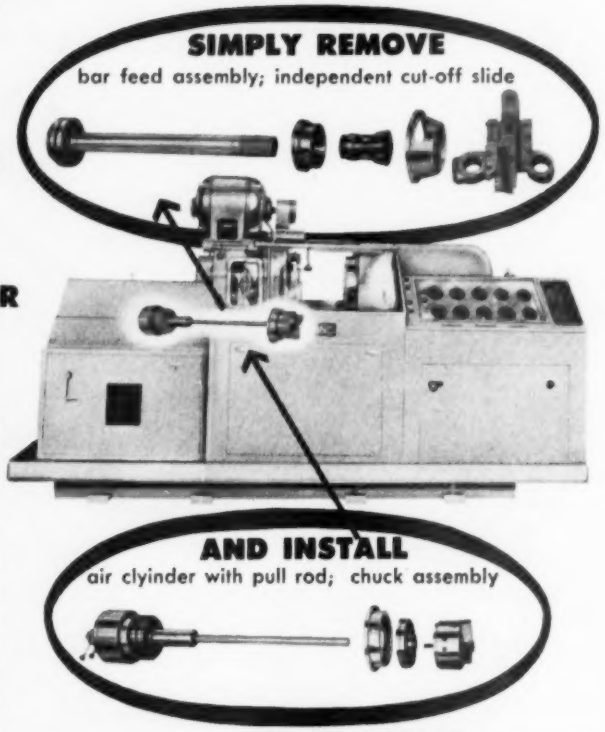
WITH THE DOUBLE-DUTY

CLEVELAND

CLEVELAND MODEL AB DIALMATIC IS *convertible*

FROM A BAR MACHINE TO A CHUCKER *in 30 minutes!*

Cleveland Model AB Dialmatic Single Spindle Bar and Chucking Automatic. 2½" and 3" Bar Capacity; 6" Chucking Capacity.



Essentially a high-production single spindle bar machine, the Model AB Cleveland Dialmatic *doubles* its utility by being quickly convertible to a chucking automatic. This and many other features make the Model AB the *most versatile single spindle automatic in the field.*

The ease with which it can be set up makes this Cleveland highly economical for the production of short run jobs formerly produced only on hand-operated machines. *No cam changes* are needed to adjust turret tool feeds—they're *electrically* controlled—simply set by positioning dials on the control panel. Cross slides are controlled by separate, adjustable drums. Cross slide tools are quickly set relative to turret operations without use of special camming.

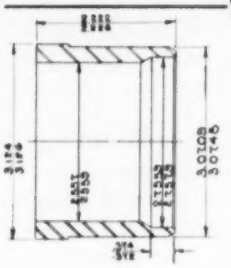
The spindle speed range is exceptionally wide. 112 speeds are available ranging from 24 to 1820 r.p.m. That gives you efficient cutting speeds for both bar and chucking work as well as for all kinds of metals and all types of tools.

A complete study of the Cleveland Dialmatic will convince you of its cost-cutting capabilities for your shop. Let a Cleveland sales engineer give you full information. For machine specifications, write for Bulletin AB.

Ever see a chucking job run in a bar machine? Shown at right is how the 2½" Cleveland Dialmatic does it — producing the part illustrated from a steel forging.

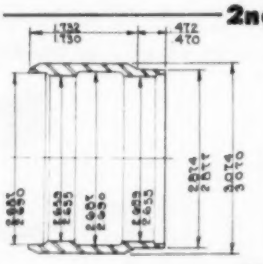
Cleveland's convertibility also gives you cost advantages as you can machine 1st operations on a part as a bar job and complete the part by performing 2nd operations using the chucking attachment.

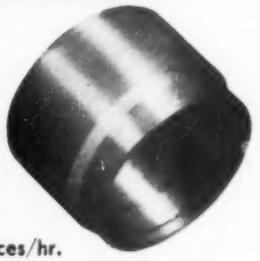
1st OPERATION



29 pieces/hr.

2nd OPERATION





17 pieces/hr.

Remember: *Clevelands Cut Costs*

THE CLEVELAND AUTOMATIC MACHINE COMPANY

4928 Beech Street
Cincinnati 12, Ohio

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CLEVELAND • DETROIT
HARTFORD • S. ORANGE

Manufacturers of a Complete Line of Single Spindle Automatic Screw Machines and High Pressure Hydraulic Die Casting Machines

TELL US, MR. CURTIS——

Why did you buy 200 DELTA Drill Presses?

"Three vital advantages built into Delta Drill Presses explain why we use 200 of them," says Charles Curtis, Production V. P. of Copeland Refrigeration Corp., Sidney, Ohio . . .

"1. **PRECISION**—a must. We fight 'tenths' in this business; normally, .002" undersize is scrapped.

"2. **VERSATILITY**—you can mount Delta drill presses upside-down, sideways, gang them in numerous ways.

"3. **LOW INVESTMENT**—numerous permanent set-ups ready for all operations are vastly cheaper than a few that involve set-up time, labor and scrap cost resulting from constant changes of set-ups. We make a variety of plates, heads and parts, and can make a run on one piece simply by taking jigs and fixtures off the shelf.

Direct labor saving of $24,000 a year on one operation

"As for special tools, here's one that out-performs a $16,000 radial drill press. We cut a Delta drill press pedestal in two, put an extension between, mounted the unit on an idle heavy base, fastened a swivel on each half-pedestal, mounting the drill head—and obtained a knee action that does all the radial drill did, only much better. The special Delta rig costing not over $300, operates at 2400 RPM as against 400 RPM; drills more than 200 pieces per day, as against 30-35 pieces; uses 3 men (always ahead of schedule) as against 7 men (always behind)—for a two-shift direct labor saving of $24,000 a year.

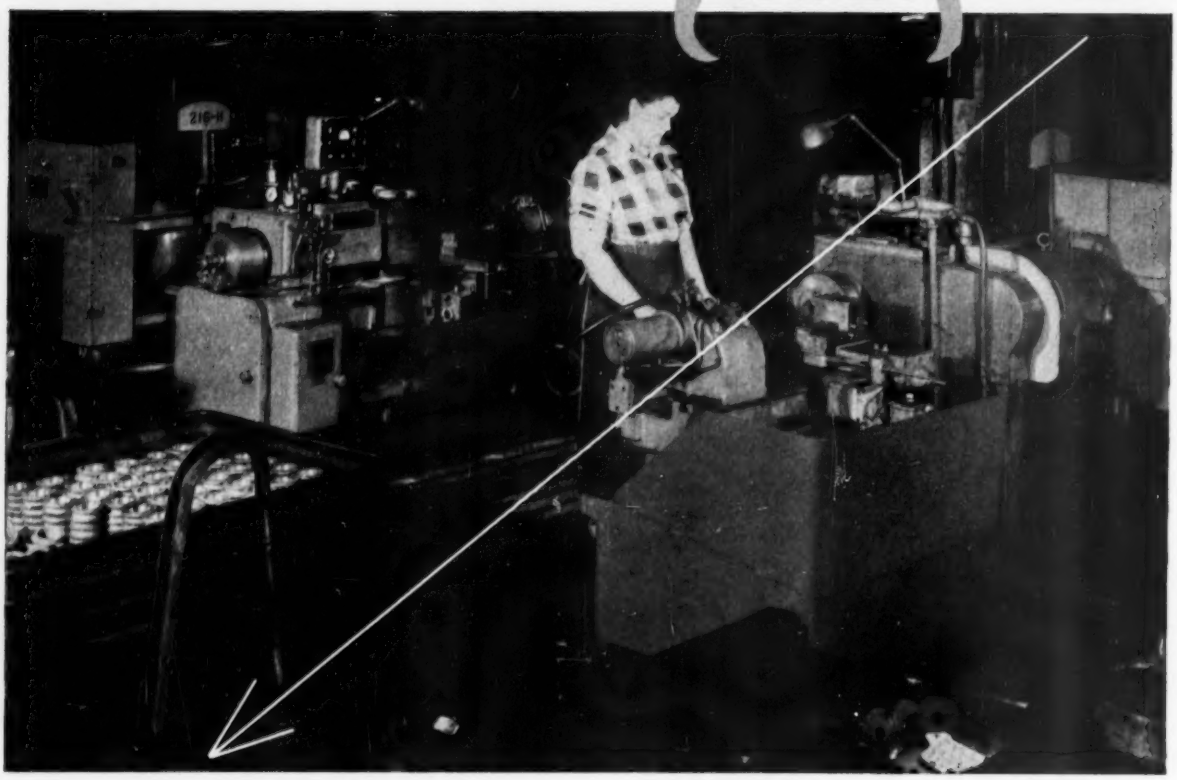
"No wonder we like Deltas."

Nothing here that a bit of ingenuity and common sense can't duplicate! —with cash benefits that can easily run big. Ask your Delta dealer for the latest Delta Catalog—listed in your Classified Directory under "Tools," —or write direct to Delta Power Tool Division, Rockwell Manufacturing Company, 618A Lexington Ave., Pittsburgh 8, Pa.

DELTA QUALITY POWER TOOLS

Another Product by **Rockwell**

Production Increased from { 4 to 32 / 18 to 65 / 40 to 150 } parts per hour



on SUNDSTRAND Automatic Lathes

These are only three of the production figures from 17 different parts turned on two Sundstrand Automatic Lathes, part of a modern turning installation. Lot sizes vary from 150 to 200 pieces. Parts are of cast iron and steel and are used in production of heavy machinery. All jobs have a better than 2 to 1 production increase over former method.

One Operator Handles 2 Machines

The units in this battery of Automatic Lathes are installed with facing fronts, as shown in the above illustration. Because of the simplicity of operation, one operator can easily run two machines. If you have turning problems in your plant call in a Sundstrand Methods Engineer. There is no obligation for this service.

SUNDSTRAND

RIGIDMILS • AUTOMATIC LATHES • HYDRAULIC EQUIPMENT

Design Features of Sundstrand Automatic Lathes that make this production possible . . .

Greater Horsepower All new Sundstrand Automatic Lathes have been redesigned for greater rigidity and larger spindle drive motors. They have ample power for use of carbide cutting tools and are capable of doing more work.

Wider Speed Range Spindle speed range ratios have been increased to 30 to 1 to obtain maximum in cutting efficiency over a wider range of sizes of parts and material. The spindle unit is equipped with two driving gear centers, which increase the range between high and low spindle speeds. In addition, four speed changes can be obtained from one set of gears instead of the usual two.

Wider Feed Range A wider feed range has been provided to enable the handling of a greater range of parts and materials at maximum cutting efficiency. The New Models 4A, 8A, and 12A have a ratio of 18 to 1 between high and low feeds — Model 16 has an even greater range.

Greater Carriage Adjustment Both front and rear carriage of the latest Sundstrand Automatic Lathes are adjustable full length between headstock and tailstock centers — another important new feature.

Faster Set-Up Convenient location of pick-off gears for changing spindle speeds and front and rear carriage feeds is provided. Feed and speed chart and pick-off gear storage compartments are readily accessible for quick set-up or changeover.

Quick Cycle Changeover Complete control of all cycles is provided by adjustment of dogs on a disk. Making cams is eliminated. Changing position of dogs on disk changes length of rapid approach, feed and rapid return strokes — enables operator to set up cycle quickly and change over from one job to another easily.

Automatic De-Clutching All new models have been provided with automatic declutching between spindle and spindle motor with self-adjusting magnetic clutch and brake for quick stopping of spindle rotation.

Screw Feed to Front Carriage All new Sundstrand Automatic Lathes have screw instead of rack feed to the front carriage — resulting in fine finish and long tool life.

4 Models Cover HP Range of 3 to 75 HP

	MODEL 4A	MODEL 8A	MODEL 12A	MODEL 16
SPINDLE MOTOR	3 to 10 HP	10 to 25 HP	20 to 50 HP	50 to 75 HP
SPEED RANGE (Type A) (Type B)	60 to 1800 RPM 120 to 3600 RPM	40 to 1200 RPM 80 to 2400 RPM	30 to 900 RPM 60 to 1800 RPM	15 to 750 RPM
FEED RANGE	.003 to .048 IPR.	.004 to .070 IPR	.004 to .070 IPR	.0025 to .100 IPR
FRONT CARRIAGE: Longitudinal feed with angular feed-in, max. Swing over cross slide, max. Rapid traverse rate	 5" 8¾" 275"	 6" 12½" 250"	 8" 15¼" 250"	 12" 17" 250"
REAR SLIDE: Max. Stroke	4"	5½"	6½"	8"
LENGTH BETWEEN CENTERS	15, 24 & 36"	24, 36, 48 & 60".	24, 36, 48 & 60"	36, 60 & 84"

FREE Additional Data...

The complete new line of Sundstrand Automatic Lathes includes the Models 4A, 8A, 12A and 16 ranging from 3 to 75 HP. Write for complete information on these new machines today. Ask for Bulletin 127.

SUNDSTRAND

SUNDSTRAND
Machine Tool Company
2533 Eleventh St. Rockford, Ill., U.S.A.

DRILLING AND CENTERING MACHINES • SPECIAL MILLING AND TURNING MACHINES

NEW! JOHNSON'S #130 WAX-COOL

A WATER-TYPE WAX COOLANT

Now, for the first time, Johnson's new *Wax-Cool* brings to machines requiring a water-soluble coolant all the benefits resulting from the *greater lubricity inherent in wax.*

For more than two years, Johnson has worked on a water-type wax cutting fluid—and today it is a reality. *Johnson's Wax-Cool* offers you the same production and tool saving advantages in a coolant that *Wax-Cut* has become known for in an oil type. Great cooling power—longer runs between tool sharpenings—a marked improvement in finish—freedom from smoking and fumes—these are the benefits wax provides.

Don't believe us. We know our claims sound like all the rest. But this time—just once—take the steps to make a thorough check of *Johnson's Wax-Cool* and *Wax-Cut,* too, in your own equipment. You're in for a surprise.

For all the facts on these revolutionary wax cutting fluids get in touch with your local Johnson distributor, or write now to

Industrial Products Dept. AM1
S. C. Johnson & Son, Inc., Racine, Wisconsin

A product of
JOHNSON'S WAX Research

JOHNSON'S *WAX-COOL*

And All Johnson's Wax Lubricants for Metal Working Are Distributed Through These Leading Industrial Suppliers

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Milwaukee 5, Wisconsin
Phone: Broadway 1-1088

Machinery & Factory Equip. Co.
1215-1219 Douglas Avenue
Racine, Wisconsin
Phone 4-3381-82-83

Goltz Supply Company
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J. H. Elliott Co.
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Two-directional hydraulic tracing uses simple template.

Tracing stylus controls cross and length feed, powered by hydraulic motors.

All controls at apron; speed and feed can be varied during cut without interrupting the finish.

Fast roughing by means of length feed only—template serves as length stop.

Mechanical power rapid traverse to carriage and cross slide in both directions built into apron. Also, hydraulic rapid traverse for retracting cross slide when under tracer control.

Standard feeds and threads available through quick change box—hydraulic motors disconnected through fool-proof interlock.

USERS REPORT SAVINGS OF MORE THAN 75%.

CONDENSED SPECIFICATIONS

Lathe size	32"	40"	50"
Swing over cross slide	22"	28"	35"
Constant hp DC motor, 2 to 1 speed change	30 hp	40 or 50 hp	
Mechanical speed changes in head	8	9	9
Speed range, variable, rpm	2.5-230	1-165	1-165
Hydraulic Feed	VARIABLE		

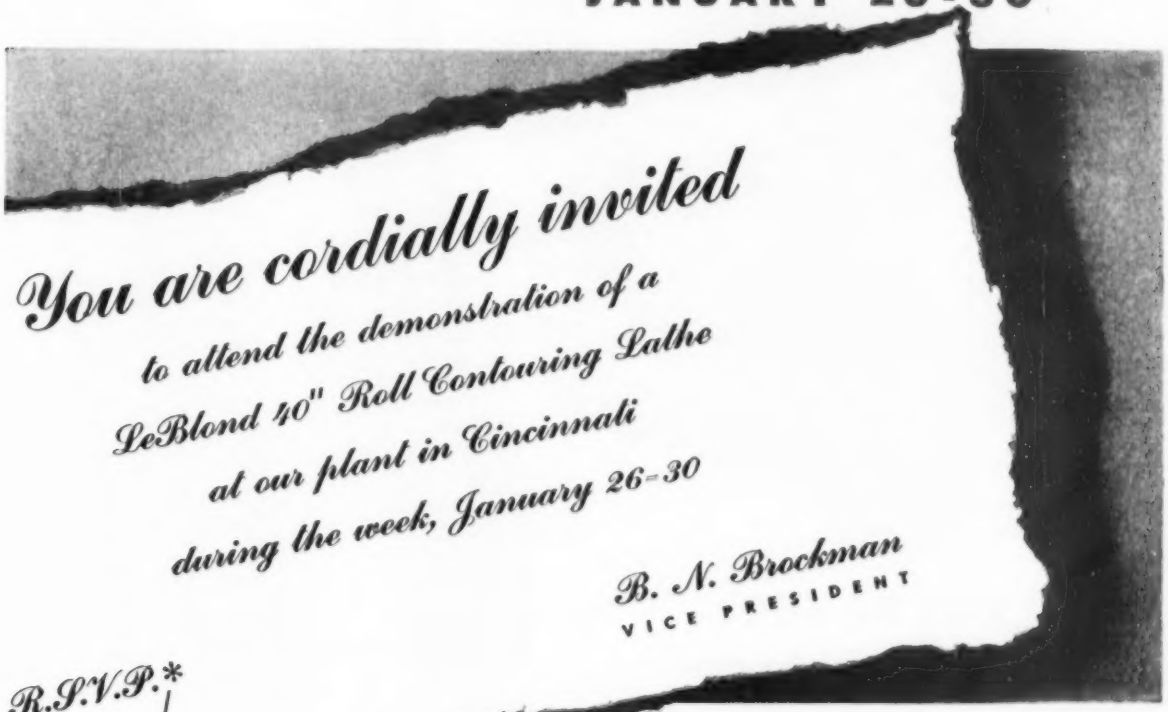
Single speed AC drive also available.

WRITE FOR COMPLETE INFORMATION

ROLL-CONTOURING LATHE

See it in operation at the LeBlond Plant

JANUARY 26-30



You are cordially invited
to attend the demonstration of a
LeBlond 40" Roll Contouring Lathe
at our plant in Cincinnati
during the week, January 26-30

B. N. Brockman
VICE PRESIDENT

*R.S.V.P.**

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* Please tell us which day you'd like to come. We'll confirm.

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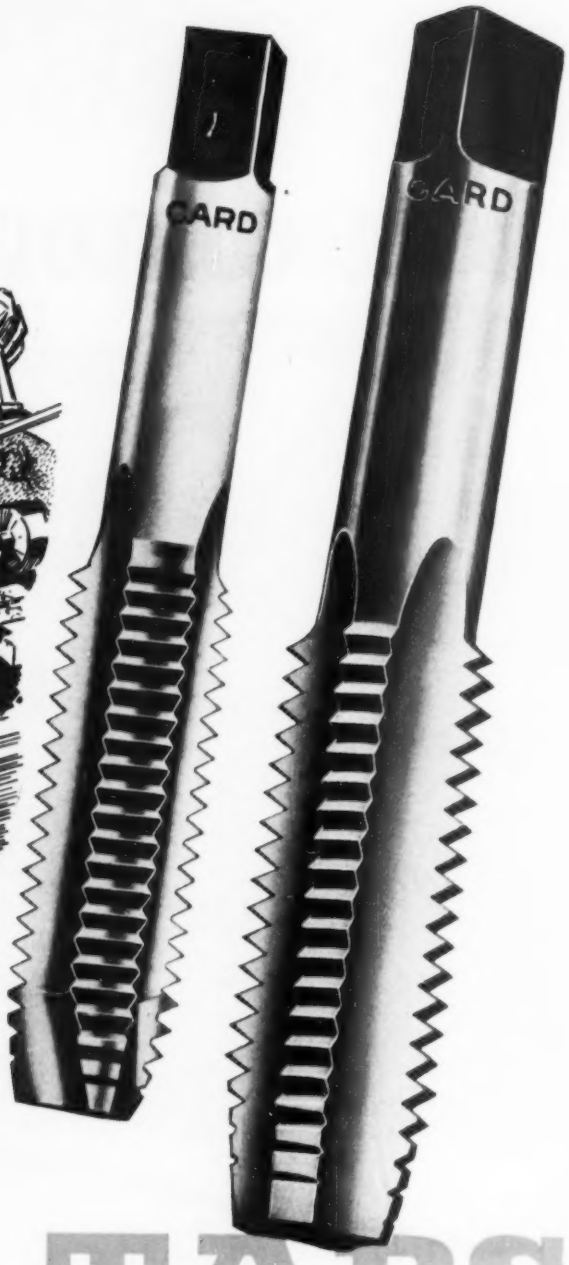

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CARD TAPS

All Card taps are given many rigid factory-inspections. They are manufactured in carbon steel and in high-speed steel — cut thread, commercial ground or precision ground. S. W. Card Manufacturing Company, Mansfield, Mass. Division of Union Twist Drill Co.

ASK YOUR CARD DISTRIBUTOR FOR COMPLETE DETAILS

The CARD Quality

TAPS

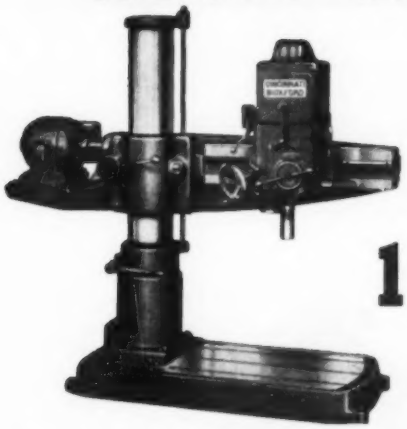
Also makers of DIES • SCREW PLATES • DIE STOCKS
TAP WRENCHES

drill with the right machine...

Wise selection from the line of Super Service Drilling Machines will bring low cost production to your shop.

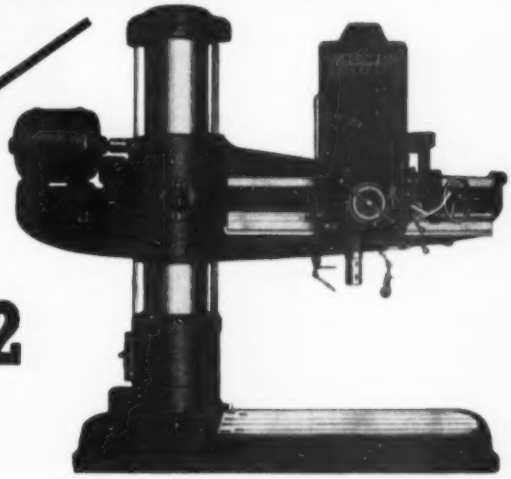
As your drilling problems are our problems, our engineers are ready to cooperate with you. We believe their services will be of real value.

Write for literature on machines of interest to you.



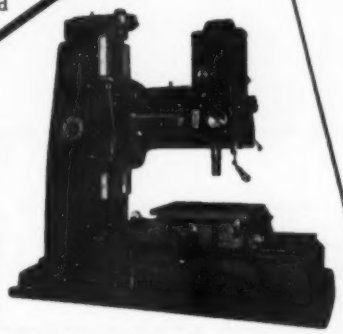
1

The 9" Diameter Column SUPER SERVICE Radial Drill, described in Circular R-21B, is built in either a 3' or 4' arm length with 9 speeds and 4 feeds powered with a 3 HP driving motor.



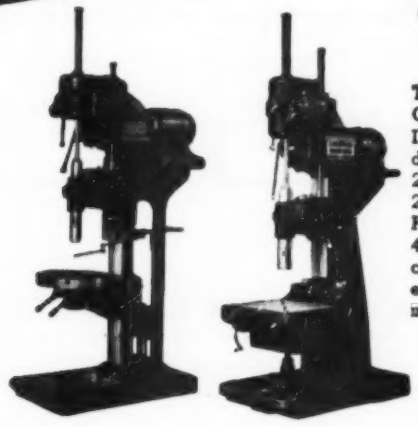
2

The 36-speed 18-feed SUPER SERVICE Radial Drill, described in Booklet R-29, is furnished in 11 different standard sizes, ranging from 3' to 8' arm lengths and 11" to 19" diameter columns. Machines are furnished with 7½ to 20 HP driving motors.



3

The new SUPER SERVICE Precision Drilling Machine is especially suited to operations in conjunction with an automatic spacing table. This 36-speed, 18-feed, 10 HP motor machine is more completely described in Circular FH.



4

The SUPER SERVICE General Purpose Upright Drilling Machines, as described in Booklet U-25-A, are furnished in 21", 24" and 28" sizes. From 9 to 12 speeds and 4 to 9 feeds. The machines are powered by either 3, 5, or 7½ HP motors.

5

The SUPER SERVICE High Production Manufacturing Uprights have many of the advantages of the general purpose drilling machines but, due to their simplified construction, they are much more economical. They are furnished in 21", 24" and 28" sizes with 3, 5, 7½ or 10 HP driving motors. Booklet U-27 will furnish you more complete details.

RADIAL AND UPRIGHT SUPER SERVICE DRILLING MACHINES

THE CINCINNATI BICKFORD TOOL CO. Cincinnati 9, Ohio U.S.A.

THE METALWORKING PRODUCTION

Agricultural Machinery and Equipment	Construction, Mining, and Oil Well Machinery and Equipment	Metalworking Machinery and Equipment	Special-Industry Machinery and Equipment	General Industrial Machinery and Equipment
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. . . the magazine he **prefers** to all others . . . and you sell industry's **greatest concentration of buying power**

In 1953, as in every other year, Metalworking offers you the biggest of all industrial markets.

It also offers you one of the world's most resultful advertising mediums . . . a magazine so clearly equipped to do a superior sales job that its advertising leadership is unquestioned.

Again, in 1952, sales-wise advertisers have invested more advertising dollars in *American Machinist* than in any other metalworking publication . . . and in doing so have written an impressive record of advertising growth. This year they have placed well over 1,200 more advertising pages in *American Machinist* than in 1951, when *American Machinist* was *third* among *all* magazines in advertising pages.

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No other metalworking publication offers you anywhere near the proved reader interest inherent in this *American Machinist* family of self-elected readers . . . and certainly none other can match this magazine's impact on metalworking production executives.

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SEND FOR YOUR COPY OF "HOW TO SELL TO METALWORKING"

This brand-new, 48-page market and media booklet has complete facts and statistics for you on the size, location, and growth-record of the Metalworking Industry, the products it buys, and how and by whom they are bought. Complete and quickly substantiated data to help you in planning your advertising is also included. For your copy, write to Promotion Department, *American Machinist*, McGraw-Hill Building, New York 36, or call your *American Machinist* representative.

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The Finest in Quality Reamers

The Reamer Specialists

LAVALLEE & IDE, INC.

CHICOPEE, MASS.

Backlash

EXTRACTS FROM CURRENT LETTERS TO THE EDITORS

Milk Shake

Some weeks back, I was browsing through the interesting items on the Talking Shop page of the metal busters' favorite magazine and received the shock of my life when I came upon Dr Peterson's study of the cow. For some time, I wandered around in a daze at the thoughts of mixing metals and meat but, finally, having been born of that Island stock noted for its inability to see a joke right off the griddle, time brought that spark of enlightenment so necessary to see through the idea.

Realization came after I had crawled in for the night but, leaping from my horizontal conditioner, I reviewed the account of the cow. On the third reading, I tumbled. Note that the enlightened doctor claims that the steadiest milk producers are cows that lack ambition and are content with their lot.

Could that, by any chance, be a subtle dig at the average mechanic who prides himself in being satisfied with his job and carries on happily at his work? Although the common run of mechanics don't drag around such a burdensome attachment as does our hay-eating Bossy, there is a parallel—they do produce more when contented.

The sloppy-nosed friend on the giving end of the vacuum line who butts her way to high places while waiting her turn to be deflated, also finds her counterpart in some of the two-legged go-getters who forge their way up the ladder of industrial success without benefit of weight or horns. The wise Doc informs us that the steadiest milk producers are cows that lack ambition. And then they call them dumb animals! Maybe the general run of machinists and toolmakers don't go around butting each other for favorite places in the production line—except a few jet-propelled individuals eager to nurse a bellyfull of peptic ulcers but, thanks to their good judgment, they do, as a general rule, live happy lives.

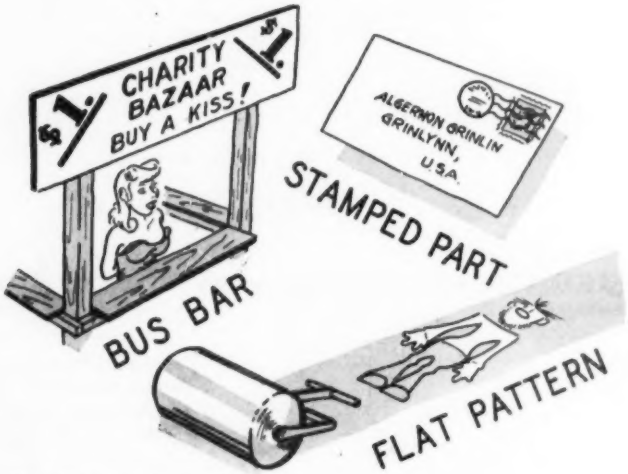
John Homewood
Ontario, Calif

Power Saws

In reading the difference of opinion of the three machinists in Backlash, (*AM*—Nov 24 '52 p102), I would like to join in on the various viewpoints. The *AM* answer was correct as far as it goes, but I am afraid

GRINETICS

By D. G. SMITH



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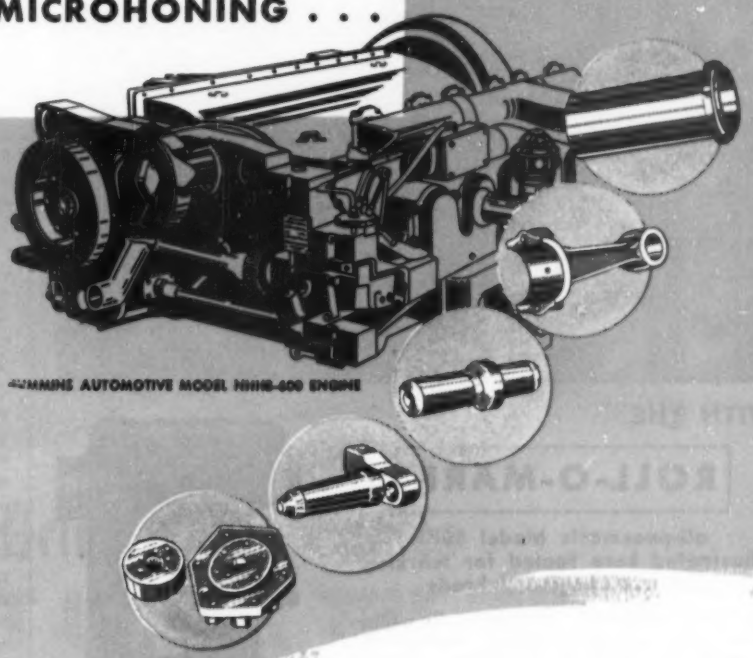
DIESEL ENGINES

THROUGH MICROHONING . . .



CUMMINS AUTOMOTIVE MODEL NHHB-600 ENGINE

Diesel engines are chosen because of their dependable low cost power. The more precise the fit of parts, the more efficient the engine.

MICROHONING gives to functional surfaces of

- cylinder liners
- connecting rods
- valve guides
- injector barrels
- pump discs . . .

accurate size, true geometry, and the characterized finish—all at production rates.

For Information on MICROHONING of DIESEL ENGINE PARTS

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MICROHONING = STOCK REMOVAL + GEOMETRY + SIZE CONTROL + SURFACE FINISH

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Leading Aircraft Engine Manufacturer
Saves 527 Hours Per Month
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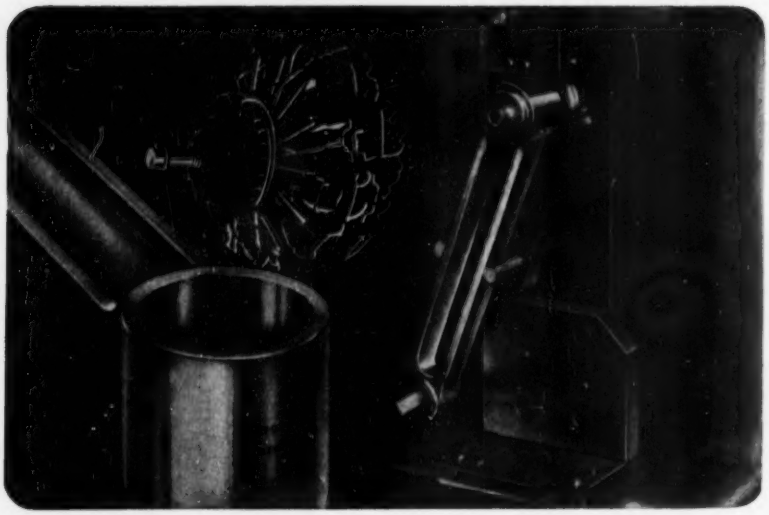
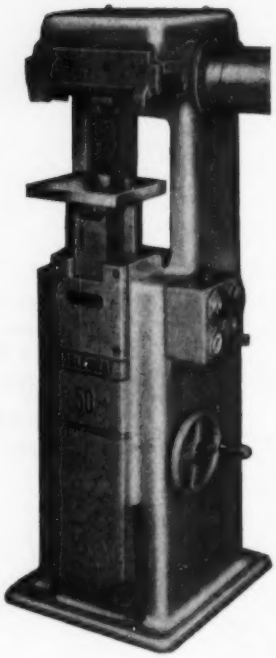


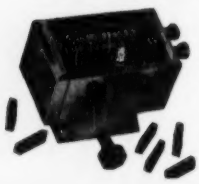
WITH THE

ROLL-O-MARK

all-pneumatic Model 50P1 illustrated here tooled for marking aircraft engine linkrods



The ROLL-O-MARK is the leader in the medium priced general purpose marking machine field. It utilizes the original NOBLEWEST *roll-marking* process which permanently rolls in inscription markings that last as long as the product itself. For the linkrod application illustrated above, tolerances on depth of mark were .0005 to .0015 —material tested 36 to 40 Rockwell "C". The ROLL-O-MARK is ideal for trade marking, part or patent numbering, codifying and serial numbering and will mark flat or round surfaces. For information on how Modern Marking Methods can cut costs in your plant, write The Noble & Westbrook Mfg. Co., 17 Westbrook St., East Hartford 8, Conn.



A MARK IS ONLY AS GOOD AS THE DIE THAT MADE IT

Noblewest marking dies and interchangeable steel type for use in NOBLEWEST marking machines are made to exacting standards that result in clearer impressions and longer life. We also make the necessary die-holders and work-holding fixtures.

MARK IT BEST WITH NOBLEWEST

EQUIPMENT FOR MARKING · GRADUATING · EMBOSSING · NUMBERING

the fellow who made the inquiry will still be up in the air. The old-time power saw of many years ago would cut equally as well backward as forward. It would cut backward or forward because the blade did not clear the work on either stroke. All power saws of modern make clear the work on either the forward or backward stroke, except those types employing a round saw blade. This latter type feeds in a circle, and the cutting edge of the blade is always in contact with the work.

The type most commonly used, however, feeds front to back. On most of these, the cutting edge faces the back of the machine and therefore cuts front to back. But there are some types that feed and cut back to front. Regardless of which stroke the saw cuts, it clears the work on the opposite stroke.

These modern saws all employ a coolant, while the old types were run dry. It is quite possible that some types of wood containing sap or gummy substances would heat up and remove temper from the blade. This would happen, however, only with green or unseasoned wood. The same thing could happen on a modern saw. If coolant were used on wood, it would clog up the clearance on the blade and cause heat which would remove the temper. Most modern saws have a feed arrangement adjusted according to the hardness or toughness of the material to be cut. If instructions are followed, wood would not burn saw blades as quickly as steel.

A E Salmons
Dixon Valve & Coupling Co
Philadelphia, Pa.

So Sorry

Your 75th Anniversary Issue is marvelous; I started going through it as soon as it came in. However, on page K12 I found a bad error. It is in the item I originally wrote, "Cast Iron is a Good Die Material." In line 5 you have "You can *blank* steel, etc." This should be, "You can

Dust, Grit, Fog or Fumes
CAN'T GET UNDER THE "SKIN"

of your *Century*

TOTALLY
ENCLOSED
FAN
COOLED MOTORS

The inner frame of your Century TEFC Motor completely seals all the vital working parts against air-borne hazards. An effective stream of air blown between the inner and outer frames, keeps the motor temperature within safe limits at rated load.

Century TEFC motors operate your equipment efficiently in any kind of atmosphere — resist dusts, dirt, chemical or oil fog, and mists.

Whatever the job or working conditions, Century's wide line of types, sizes, and variety of operating characteristics, enables you to select the motor specifications for top equipment performance.

⅛ to 400 horsepower ratings — A.C. or D.C. — Furnished in Drip Proof — Splash Proof — Dust Proof — or Explosion Proof frames — for most all atmospheric surroundings.

Specify Century motors on your new equipment or replacements. Your nearby Century District Sales Office or Century Distributor will be glad to give you full information.

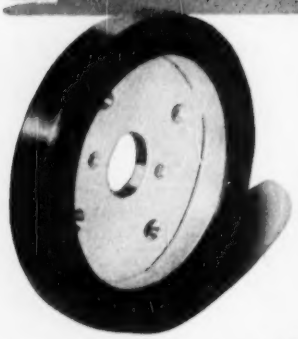
Century C MOTORS

CE-765

CENTURY ELECTRIC COMPANY • 1806 Pine Street, St. Louis 3, Missouri

Offices and Stock Parts in Principal Cities

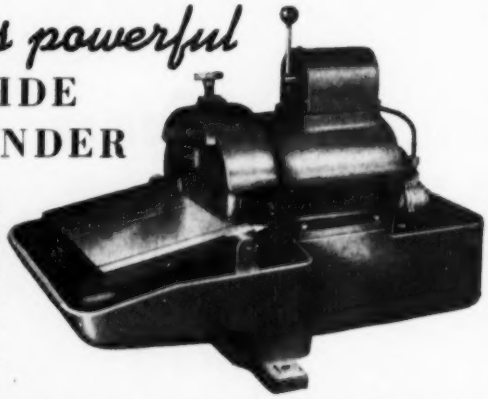
Grind More Carbide *per Carat of Diamonds*



. . . with STEEL-BONDED DIAMOND WHEELS

Wickman-Neven Steel-Bonded Diamond Wheels stretch wheel life —lower your carbide grinding costs because they're practically indestructible. They can't be damaged even by plunging sharp-pointed tools into them. Diamonds stay in place until worn to give more cuts per carat. These wheels also give up to 300% longer carbide tool service by producing a strong, uniform cutting edge that resists breakdown.

. . . and this powerful CARBIDE BENCH GRINDER



Ideal for all off-hand carbide tool grinding, the Wickman Model GF-2A is heavily built for years of service even by unskilled help. The 1 HP direct-drive motor is quickly reversed, and the wheel guard swivels for right- or left-hand grinding. A built-in coolant pump delivers 12 GPH; primer and strainer are also included. This machine comes furnished with a steel-bonded diamond wheel of your choice. Protractor also available.

For the complete story on Steel-Bonded Diamond Wheels, Resinoid-Bonded Diamond Wheels and Wickman grinders, write on your letterhead for this new 24-page catalog.

THE Wickman MANUFACTURING CO.

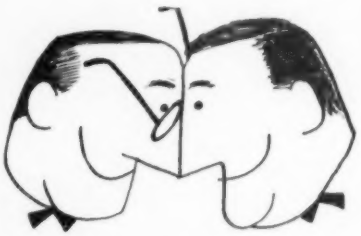
10325 CAPITAL AVENUE OAK PARK, DETROIT 37, MICHIGAN

draw steel, etc." Cast iron is useless for blanking because the edge crumbles very easily; the hard iron carbide is not supported in the matrix.

In the last 25 years, I missed being a subscriber for only two years: I was in the Army so couldn't help it. Your magazine has been of inestimable help to me as a toolmaker, and now in my own business.

Looking forward to your 100th Anniversary.

J H Sperman
Brooklyn, N Y



Great Minds

When I turned the opening pages of the 75th Anniversary Issue of *AM*, I began to think maybe there was something to this mental telepathy stuff.

We had just gotten from the printer the first copies of a new brochure we prepared for one of our clients. If you will open the enclosed copy, you will see the deadly —or maybe I had better say lively —parallel. We titled some of the decades a little differently, but got together on those "roaring twenties."

Anyhow, I want to say that you have done completely and magnificently for Metalworking what we tried to say briefly and to make a definite point, for the automobile.

It is nice to know that our "slant" was good enough so that it would occur at the same time to a McGraw-Hill editorial staff or, as they used to say when we were kids, "Great Minds Run in the Same Channel."

M Elgutter
Van Auken, Ragland & Stevens
Chicago.

The booklet in question traces the development of automobile brakes from the time of the one-lunger to present, and show that today's increasing horsepower and speed make necessary some different principle of braking than that which was designed for the single-cylinder, 6½-hp, 15-mph horseless carriage. Prepared for Auto Specialties Mfg Co. it offers the Ausco-Lambert double-disc brakes as a solution to the stopping problems.—Ed.

HOW WOULD YOU

MACHINE THE ENDS OF THESE
3 RECTANGULAR HOLES, AT AN ANGLE,
IN THIS

COMMANDER'S CUPOLA
forged of ARMOR STEEL

it's easy and accurate
with **LAPOINTE BROACHING!**

The best way to do it is to use this rigid 25-ton LAPOINTE HP-50 Horizontal BROACHING MACHINE with 72-inch stroke. The three holes, including radius corners, can be broached at the rate of *one finished part every forty minutes!*

NOT BAD! . . . when you consider the size of this part — diameter nearly 40 inches.

NOT BAD! . . . when you realize that the material being broached is **armor steel.**

NOT BAD! . . . when you begin to figure how you would handle this big part to machine these holes — at an angle — **by any other method!**

Write for Bulletin HP-1.

Of course the FIXTURES and BROACHES were also engineered and built by LAPOINTE, for we can take the complete responsibility.

ADAPTABLE TO OTHER BROACHING JOBS
The LAPOINTE HP-50 Broaching Machine is versatile. It can readily be adapted to the broaching of numerous other parts.

THE LAPOINTE MACHINE TOOL COMPANY

HUDSON, MASSACHUSETTS • U. S. A.
Branch Factory: Watford, Herts., England

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THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES

More than 30 years' *past* experience in supplying diemakers' needs has taught Danly how to foresee *future* needs. In almost every instance, there are *standard* Danly Die Sets and *standard* Danly Diemakers' Supplies to meet your diemaking specifications.

You can rely on Danly's reputation for precision and dependability when you start your tooling program. You can be sure of prompt delivery from completely stocked Danly branch assembly plants located in nearly every major toolmaking center.

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**Indicates complete stock*

SPOT NEWS of Metalworking

- **Left-wing unions will have future trouble in operating.** Justice Department has obtained a conviction of a union leader for signing a false non-communist affidavit. National Labor Relations Board has also decertified his union as bargaining agent in five Camden, N J, plants. A New York grand jury has also asked NLRB to revoke all certifications of four left-wing unions in that state.

- **Titanium may get into aircraft wing-tip pods.** Aircraft company has undertaken exploratory work to see if it's possible for a nightfighter, which has wing tip requiring the maximum amount of machining and fabricating. If they can beat this job, others will be easier.

Industrial fires are caused by electrical failures, friction, and foreign substances, in that order. Recent report shows 19% of industrial fires start in electrical equipment, 14% by friction and 12% by foreign substances. Contamination is considered most knotty problem.

- **Stabilizer Mike DeSalle will try to get around** NAM and U S Chamber of Commerce boycott of stabilization board by appealing directly to large companies to put their own men on WSB, to save it from collapse.

- **AFL president George Meany admits the odds against reunion of AFL and CIO** are high —about 8 to 5, which seems high to outside observers.

- **Electrical industry is due for more intensive CIO raiding** against left-wing United Electrical Workers. It fits their plans for Department of Justice to take away citizenship of James Matles, top UE organizer. More help is due from Walter Reuther in return for support he received from James Carey, head of IUE-CIO, which helped him win CIO presidency.

- **Britain is not behind Germany in machine-tool development,** says J R Greenwood, chairman of Craven Brothers of England. He bases opinion on knowledge of what's in his nation's shops, not on what was seen at Hanover and Olympia machine-tool shows. He blames lack of space for lack of showing of heavy British equipment; and also lack of buildings with heavy enough foundations to take the load for such a show.

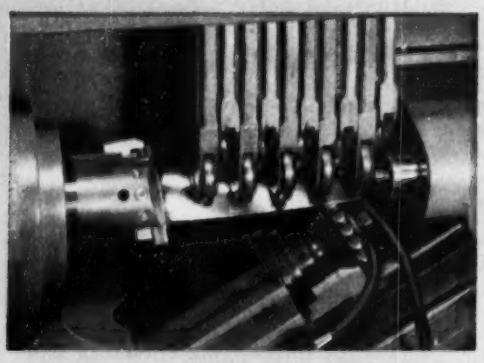
Republic F-84-F Thunderstreak outperforms MIG-15, according to Roy T Hurley, chairman and president of Curtiss-Wright Corp. He credits the Sapphire turbojet engine for speed that will take the plane from New York to Chicago in one hour. Same engine will power the twin-jet Martin Canberra B-57 and an undisclosed Navy plane.

- **Pilot-training device, called kinorama, will help judgment in fog conditions** and train to reduce pilot error in judging airport approach lights. Developed by National Bureau of Standards, the mechanism works something like a blind-flying trainer, with plotted approach course compared to pilot's estimate of the course to adjust his judgment.

- **British aircraft production will start levelling off,** although continued slower expansion is certain. Highest priority planes English are making are Canberra bomber, Hunter, Swift, Javelin, Valiant, and Gannet. Stretchout in Britain is expected to make continued production of the six high-priority types more necessary.

- **Nuclear power plant much larger than prototype or Mark II** for submarine Nautilus is being designed and developed for propelling Navy ship, perhaps aircraft carrier. It might also be forerunner of fixed industrial-power plant.

- **New gadget gages production-turntable speeds so production planners** can set up most efficient operations for a given line. Unit has almost instant speed change and reversal, which might be useful when turntable has to be stopped to pick out a reject or to make adjustments or repair on products.



Close-up of a jet aircraft blade and Continental cutter on Ex-Cell-O Style 86 Precision Profile Miller

These carbide tipped milling cutters are designed to take heavier cuts in stainless steel. This feature reduces glazing or work-hardening commonly experienced with conventional cutters. They're manufactured by Continental and used on profile millers for jet aircraft blades. If you are machining jet blades, or have any other job on which "performance-proved" tools can be used, get in touch with Continental or call in your local Ex-Cell-O representative.

Continental

TOOL WORKS

DIVISION OF EX-CELL-O CORPORATION

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CTW

53-11

Washington

Metalworking executives hold top spots in the new administration. And the list keeps getting longer as more and more of the second-level jobs are filled in.

Auto and aircraft officials dominate defense department—the biggest single customer of the metalworking industries. GM president Charles E Wilson will have one of his own GM vice presidents, Roger M Keyes, as his undersecretary.

That's the second-biggest job in the defense department. Undersecretary actually runs the department on a day-to-day basis. Mr Keyes' last GM job was as general manager of the bus and truck division. But his previous GM job should stand him in even greater stead at the Pentagon—he was top GM man on procurement and production scheduling.

As the pressure to expand arms production eases off, efficiency of defense operations becomes even more important, gets more attention. That's where Keyes should shine.

• • •

Harold E Talbott, board chairman of North American Aviation and a Chrysler official, will hold down the third-biggest job in defense—Secretary of the Air Force. The Air Force buys about $20 million of hard goods a year.

Steel industry contributes George Humphrey, who will be Secretary of the Treasury. He knows the business from his spot as president of the big iron ore and coal company, M A Hanna.

A real brake on inflation is hinted in the new treasury staff. Key man is Randolph Burgess of New York's National City Bank. He's in charge of debt management—and most economists hold that federal debt management has been the "engine of inflation" during the war and postwar years. But treasury has an anti-recession expert, too—Marion B Folsom. He's from Eastman Kodak and is a top man in the Committee for Economic Development, and has experience working with Congress on long-range economic planning. President-Elect Eisenhower promised, you'll remember, to use the full power of the federal government to fight a depression.

• • •

Windup of tank production, set for next year, won't end Army contracts at all plants. Some will get orders to modify the tanks they have been producing. That will run their Army work another year or more.

• • •

Departing officials in the mobilization agencies—both Civil Service careerists and men from private industry—air their gripes about what's been going on in Washington.

Major target of the gripes is the government's policy on strategic materials. Consensus of critical opinion: we've been spared dangerous shortages only because the military build-up program has been stretched out so frequently.

Top-ranking metals-expansion planners spend 95% of their time negotiating among themselves, not with the metals producers and consumers, one frustrated official estimates. ODM, DPA, NPA, DMPA, OPS, MSA, State-Dept and Interior-Dept officials have all gotten into the act.

There are other complaints that are more subtle. Friction has developed between officials from industry and career government men. Too frequently, important policy decisions have been made without technical consultation.

Officials responsible for metals expansion bitterly disagree with recommendations that price-control authority be retained. They say price control should be scrapped because it has been a brake on expanded metals output.

DMPA has mapped out expansion programs for 42 materials. Half of them have been completed. Only seven are less than 70% finished. These are presumably cobalt, nickel, tantalum, columbium, industrial diamonds, beryllium, and titanium.

• • •

Fourth agency in two years has taken over wage controls. The new wage-stabilization committee of all-public members will dispose of pending wage applications, supposedly only until employer representatives can be induced to return to the wage stabilization board. Actually, there is little chance of their coming back.

• • •

New cost-of-living index coming out in February (for January) will require renegotiation of wage escalators in automobile, farm-equipment, and aircraft plants.

Biggest difference will be the shift to a postwar base period of 1947-49 from prewar 1935-39. This will drop the index figure from around 190 to about 115. It won't stir up too much trouble in itself because BLS will, for a while, also use the prewar base.

But BLS is also using a new "market basket" for pricing the cost of living. For the first time it will include the cost of owning and maintaining a home and restaurant meals. This makes it a brand-new index—justification for reopening the five-year automobile and other escalator clauses.

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Detroit

Aluminum producers keep knocking at automotive doors. They have started off enough development work that they figure many applications of their metal will replace steel or other materials by 1954 or thereabouts. Alcoa, in fact, has publicized estimates that aluminum consumption on passenger cars in 1954 will be double that of 1950—even though 1954 car volume won't reach the record-high total of 1950.

Here's where the lighter-metal people figure they'll expand most: In cylinder heads, and in blocks and crankcases as well; in wiring and radiators; in carburetors, fuel pumps, and timing gears. They're looking interestedly at body-trim uses, too.

Another light material is in the designers' thinking these days, too—plastics. A scattering of military vehicles with plastic sections are running around under test in the field. Practically all automobile companies have test panels, or complete plastic bodies, in similar testing stages.

• • •

Willys, incidentally, showed the most breathtaking plastic body job yet at its recent Toledo preview—a shell offered by a West Coast plastics fabricator, installed on the Willys chassis, the whole thing costing $3200. It had lines in the best European sports-car tradition.

• • •

Looking ahead to the things that are new, you'd be interested in these recent predictions in a speech by James C Zeder, Chrysler engineering chief:

Power steering will become nearly universal, at modest cost.

Air conditioning—both heating and cooling—will be far ahead of present standards.

Abundant electrical power will become available to do everything from locking doors to warming windshield glass.

Tires may last a normal lifetime—as may brake linings.

Engines will be still smaller, more rugged and economical and more silent.

• • •

Everybody has advanced ideas these days, is doing something about them, too. And the competition is breaking out all over. Chevrolet sales chief W E Fish never mentioned Ford by name in speaking recently to newsmen, but he did say that, "Chevrolet doesn't underestimate its opposition—but neither does Chevrolet overestimate it!"

Another tart Fish remark: "We sold some 200,000 cars more than our nearest competitor. I wouldn't mention that, but there seems to be some doubt in some quarters as to who is actually first in this industry."

Ford got in some good licks of its own in another direction lately, after publication of a Wall Street Journal story on company earnings. The story's conclusion: That Ford was definitely second place in the industry dollarwise, not Chrysler. In denying the figures in the story, Henry Ford II remarked with some impish piety that "it was only fair" to admit, however, that the second place position ahead of Chrysler was a true reckoning.

• • •

One Ford veteran replaces another in purchasing. Succeeding the late Carl Unruh as director of purchasing is Charles H Carroll, former general purchasing agent of parts and materials. Mr Carroll is replaced by Harold E Joy, hitherto agent for raw materials.

Purchasing-agent reports from all Detroit companies indicate a gentle and continuing improvement in business. Employment keeps creeping up. Future buying policy is lengthening out—although inventories seem to be oozing upward. Business conditions stay about the same; so do prices.

• • •

Harking back to Ford for an instant; that company, it now comes out, has thus far spent $800 million in plant expansion and renovation since the war. More important right now: It still has $244 million budgeted for expenditures of this sort through 1954. Programs for 1955 through 1961 have been roughly blocked out.

Although household appliance companies knew that Bendix was coming out with its combined washer-dryer, most of them were taken short when the announcement came earlier than expected. The result: The network of appliance companies with affiliates in Detroit is working overtime to produce competition. Much hasty tooling can be expected, and soon.

• • •

A brand-new type of power steering will make its appearance in 1953. This design, rather than using atmospheric pressure off a cylinder, will take its power directly from the engine—and will siphon off less power than it takes in existing systems to run the hydraulic pump. Besides that, it's cheaper.

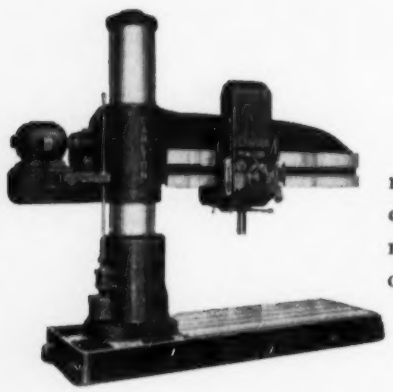
• • •

Reo is serious about getting into the toy business. It has released tooling on some toys, and is in advance stages of development with others.

Delco Remy Div of General Motors will build a West Coast automobile storage-battery plant at Anaheim, Cal. Size: About 175,000 square feet. Delco also makes batteries at Muncie, Ind, and New Brunswick, NJ.

look, fellas, Two hands!

YES, YOU CAN USE BOTH HANDS WHEN YOU RUN A CARLTON RADIAL DRILL . . . THAT'S THE NATURAL, EFFICIENT PROFITABLE WAY . . . WITH CONTROLS ARRANGED IN LOGICAL, CONVENIENT ORDER ON BOTH SIDES OF THE HEAD . . . CARLTON RADIAL DRILL OPERATORS ACTUALLY DEVELOP "TOUCH SYSTEMS" THAT SAVE TIME AND EFFORT.



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Carlton

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Machine Tools

No one can be sure of exactly how much machine-tool business will come out of the defense program in 1953. But some estimates have been made by people within the armed services.

The Navy, as it looks ahead, is reported to need upwards of $350 million of machine tools. The Army and Air Force are less specific.

But the three services' requirements add up to a total of $800-$900 million to be bought in the three fiscal years, beginning July 1, 1953, and ending June 30, 1956.

That would average out at close to $300 million a year. How much of it will be spent the first fiscal year is problematical.

• • •

Certain Washington estimates put machine-tool purchases for defense at about $2.5 billion for fiscal years 1951, 1952, and 1953. That covers the period from July 1, 1950, at the beginning of the Korean struggle, to June 30, 1953.

The total for fiscal 1953 is over $300 million and is included in the above figure. No one knows how much of the $300 million has been placed to date.

Government bureaus have come up lately with $14,500 as the average value of machine tools bought for defense programs since Korea. Average values of pool-order machine tools is said to be close to that figure too.

• • •

NPA is reported to have begun a study of the critical list of machine tools which can be shipped only to rated customers. The object is to determine whether some of the types can be removed because of the easing of the situation.

Cases already have arisen in which builders have scheduled more machines for shipment than rated customers needed at the time. Only recourse was to appeal to Washington for permission to sell the extra machines to unrated customers.

But don't look for any drastic change in the critical list in the immediate future. It will be a while before the NPA study will be completed and action taken.

• • •

Offshore aircraft - procurement program for Nato defense purposes, totaling well over $1 billion, will involve preproduction costs of $70-$90 million. No breakdown is available, but this amount includes new plants, new machines and tools, dies, jigs, and fixtures.

Number and kinds of machine tools to be bought have not yet been spelled out. There is no telling at this point whether European or American machines will be purchased.

• • •

November shipments of machine tools were around $100 million, or slightly under the dollar volume in October. On the National Machine Tool Builders' Index, shipments during November were at 338, as against 357 the preceding month.

New orders continued to shrink. The November index stood at 210. October was at 243.

Backlogs were down to a little more than 10 months. And these orders are badly distributed through the industry. Some builders have very long backlogs and others relatively short.

• • •

Defense Production Administration has set up an expansion goal for enlarged manufacturing facilities to produce some 450 so-called "elephant" machine tools.

The project will be financed by GSA with existing defense funds. It will enable the production program for long-lead-time machine tools, funds for which will be in the fiscal 1954 Defense Department budget, to be speeded up.

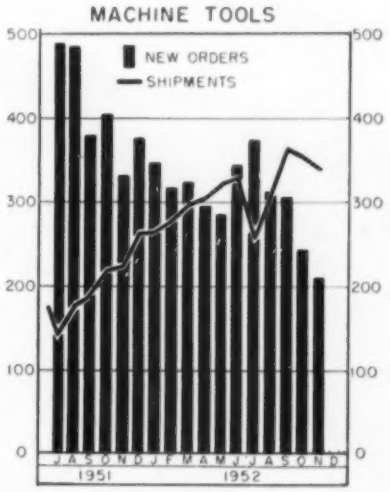
• • •

GSA is now completing negotiations with two machine-tool builders for participation in the expansion program. Whatever facilities may be required, if provided out of buil 'ers' own capital, will be permitted 100% write-offs under certificates of necessity.

GSA-financed plant equipment involved in the program will be rented to the builder at 1% annually of the tool's value, provided the builder uses the machines at full capacity.

If the machines are only partially utilized, the rent will be lower and the builder will receive a government allowance to maintain the machines in good condition.

Machine tools installed by GSA in builders' plants for manufacture of long-lead-time machines will be on five-year lease.



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output on
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Two hundred wide-face (2.490") automatic transmission pinions (1.327" O.D.) are shaved automatically every hour by one operator on two of these conveyorized 870-A Universal gear finishers. The operator merely loads the hobbed pinions in the hopper, which automatically gauges each one for size and helix angle. He removes the finished pinions from the apron at the end of the mesh ejector conveyor. With Michigan's modified underpass method of shaving, these long pinions are shaved in only 24 seconds total cycle time while using comparatively narrow shaving cutters. The 16 tooth, 18 pitch, 20° pressure angle pinion has a 15° 47' 48" right hand helix angle. Pinions are all shaved to well within the manufacturer's close tolerances for finish and accuracy.

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Should any Michigan automation-equipped shaving machine be needed at any time for shaving another gear, it may be converted to standard operation. Any pinion, gear or cluster gear, within the capacity of the gear finisher, may then be accurately shaved, either in job lots or in high production.

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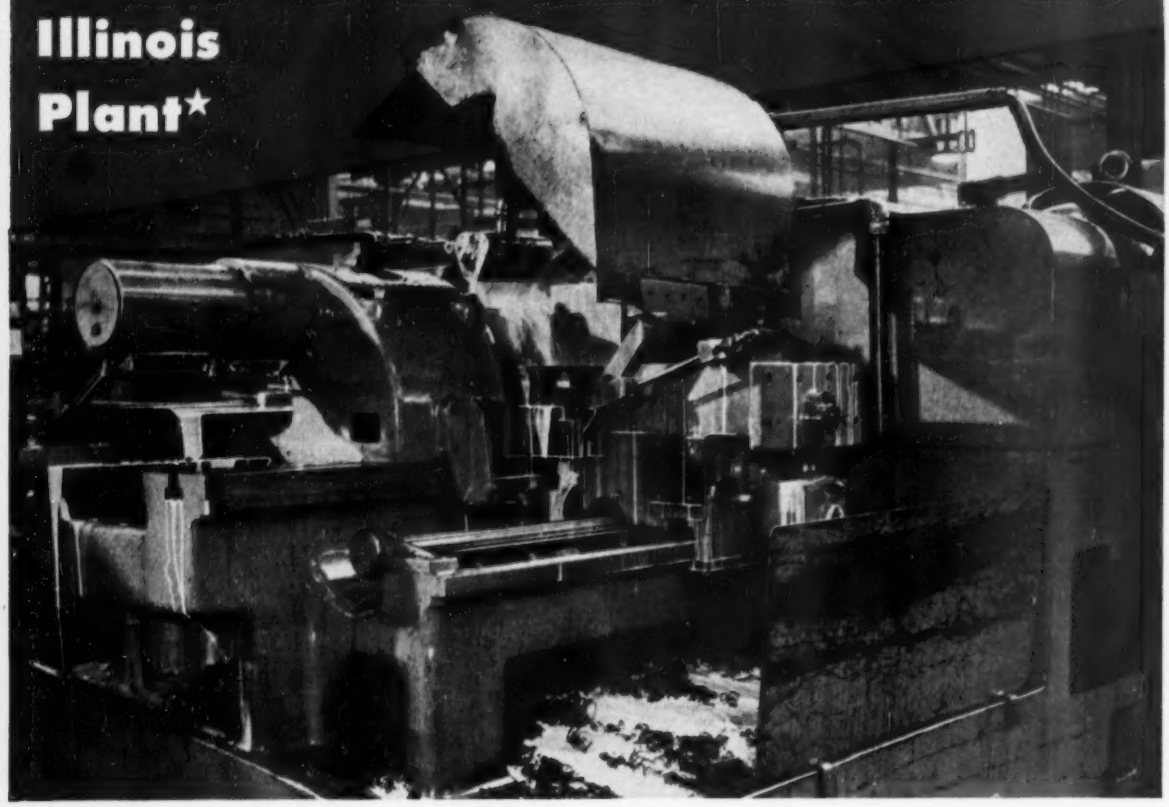

*Name on request.

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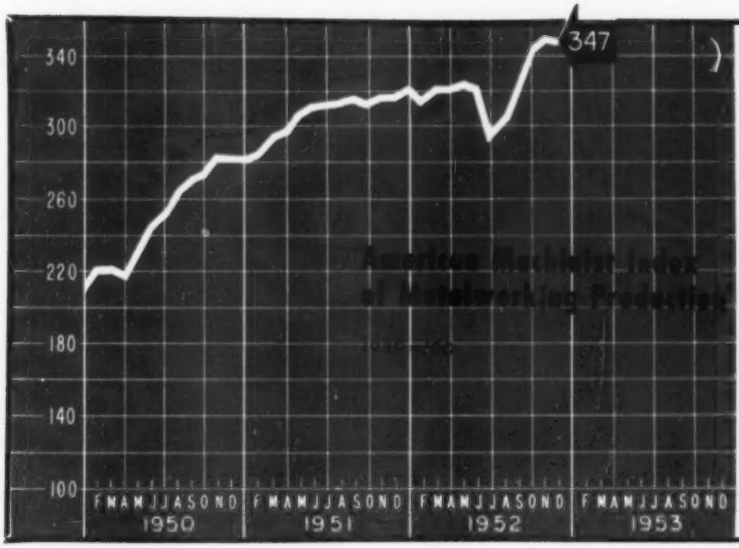
Gaging Metalworking



PRODUCTION INDEX

BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

NOV '52(*)	OCT '52(p)	SEPT '52(r)	OCT '51
338	338	330	306

	DEC	NOV	OCT	NOV '51
Total Index	347	349	343	311
Machinery	315	309	309	
Electrical Machinery	412	398	356	
Autos	254	253	216	
Other Transportation	573	566	478	
Other Metalworking	352	346	307	

(*) Estimated (p) preliminary (r) revised

The Christmas holidays interrupted only momentarily the amazing production performance of the nation's metalworking industries.

Instead of merely holding its own during the fourth quarter, Metalworking zoomed upward. This spurt caught everyone by surprise.

• • •

A new peacetime peak was attained in November. The American Machinist index then climbed to 349 (with 1939 taken as 100).

That meant that the hours worked in Metalworking in November were three-and-a-half times those worked in 1939. That was a gain of 12% over the same month a year ago.

• • •

The biggest upswing occurred in the aircraft industry. Evidently defense production is really clicking. Plane manufacture is bound to stay up there and even to go higher.

Automobile assemblies, too, registered a strong gain. What's more, car output should continue in big volume for some time.

Appliance production has been caught up in the whirl which has taken Metalworking to new heights.

Increases are not confined to these segments of the metalworking industries, however. They are widely spread throughout all kinds of products and throughout all parts of the country, although appliances are doing better, generally, than other items.

• • •

Despite the fact that huge quantities of materials are being chewed up, hardly anyone is being hurt by lack of steel now.

Some manufacturers are a bit uneasy because they cannot accumulate what they regard as a balanced inventory of raw materials.

Inventory of steel in warehouses is believed to be about 50% in tonnage and less than that in items.

Here are the scarce items (which are likely to continue short through the first half of the year): Structurals, heavy-gage plate, heavy rounds and squares, and sheets.

Sharp pick-up in appliance and automotive manufacture caused the tightness in sheets. Strip, by contrast, is relatively easy.

Alloy steels are in fairly good supply from mills, but warehouses are up against trouble in getting these steels heat-treated.

• • •

First-quarter production should be at a very high rate throughout Metalworking. But whether it will keep up the terrific pace of the fourth quarter is anybody's guess. It is not likely to drop off much, however.

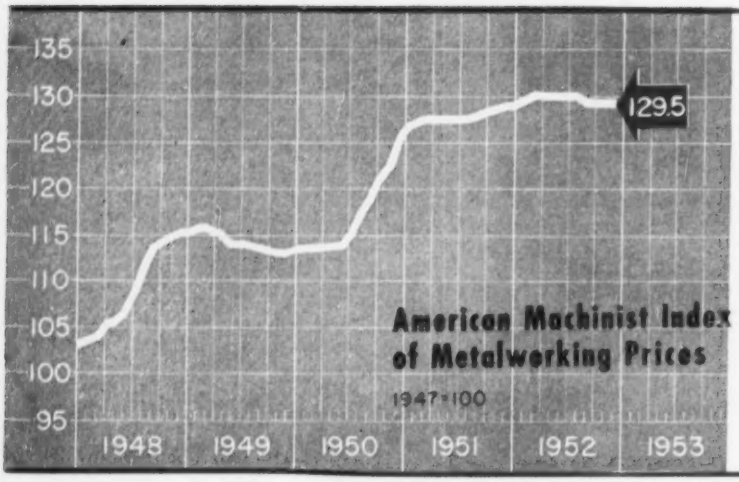
Malleable-foundry industry is estimated to have produced 925,000 tons of castings in 1952. That compares with 1,083,000 tons the previous year. Prediction for 1953: 950,000 tons.

• • •

Shortage of skilled men is reported from many sections of country. Results: (1) Some pirating by metalworking firms, and (2) quite a lot of sharp bargaining by experienced shopmen out to make the best deal for themselves.

Makers of gas-using appliances have been doing very well all the past year. The expanding market for natural gas has been a boon to these manufacturers.

Gaging Business



PRICE INDEX

	DEC '52(*)	NOV '52(p)	OCT '52(r)	NOV '51
	129.5	**129.5**	**129.6**	**128.9**
Metalworking Machinery	**137.7**	**137.9**	**136.7**	
Other Machinery exc. Electrical	**132.2**	**132.1**	**132.4**	
Electrical Machinery	**123.9**	**123.9**	**127.1**	
Fabricated Metal Products	**128.1**	**128.2**	**115.1**	

(*) Estimated (p) preliminary (r) revised

Production levels are so high, they are piling up inventories at all levels of distribution. This in spite of record sales in most of metalworking, particularly consumer goods.

Federal Reserve Board index will probably hit 230 for December (1936-1939 = 100). Fourth-quarter production will therefore average about 229, 5% over 1951's last quarter.

• • •

Electrical machinery held up in October, both in sales and new orders. Business for the month ran to $1.2 billion, 20% over last October.

Machinery manufacturers sold $2.0 billion in October, which was up from September. New orders for October were 13% down from a year ago, however.

• • •

Employment is still rising, with November a record month since the last war. Manufacturing jobs rose to 16.5 million. There are some seasonal declines, as in tobacco and food, but those who look for Christmas-time jobs made the total unemployed rise. Only temporary.

Gains in personal income came in the last half of the year—because of higher employment and more working hours. Total income was $280 billion, and net disposable income, after taxes, was $245 billion in December.

• • •

Civilian producers will get 70% of the steel they used pre-Korea in the second quarter of this year. Auto companies will be allowed steel for 1¼ million cars that quarter, but they will have permission to make ¼ million more if they can scare up their own steel supplies from their own sources.

• • •

Retail sales for the last quarter of '52 will probably set a record. In October they were 6% ahead of Oct '51, and November and December figures will run even more ahead of the same months in '51.

WEEKLY BUSINESS INDICATORS

	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1923-1925 = 100)*	248.1	247.9	236.1
Steel ingot operation (thousands of tons)	2,196	2,207	2,097
Electric power output (million Kilowatt hours)	8,140	8,165	7,667
Production of automobiles and trucks	126,631	129,005	115,627
Engineering construction awards (*Eng. News-Record*—millions)	$167	$241	$139

MONTHLY BUSINESS INDICATORS

	Latest Month	Preceding Month	Year Ago
Index of industrial production (1935-1939 = 100)*	229	227	219
Index of durable manufactures production (1935-1939 = 100)*	297	294	277
Durable goods manufacturers' sales, millions*	11,974	11,510	10,770
Electrical machinery manufacturers' sales, millions*	1,200	1,256	1,038
Other machinery manufacturers' sales, millions*	2,032	1,966	1,947
Durable goods manufacturers' new orders, millions	11,994	12,198	12,567
Electrical machinery manufacturers' new orders, millions	1,318	1,311	1,313
General machinery manufacturers' new orders, millions	1,872	1,883	2,139

* Seasonally adjusted

NEW T-J Spacemaker AIR CYLINDERS

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SQUARE HEADS WITH TIE RODS
SPACE SAVED
T-J SPACEMAKER . . . provides additional room for adjacent equipment without sacrificing strength.

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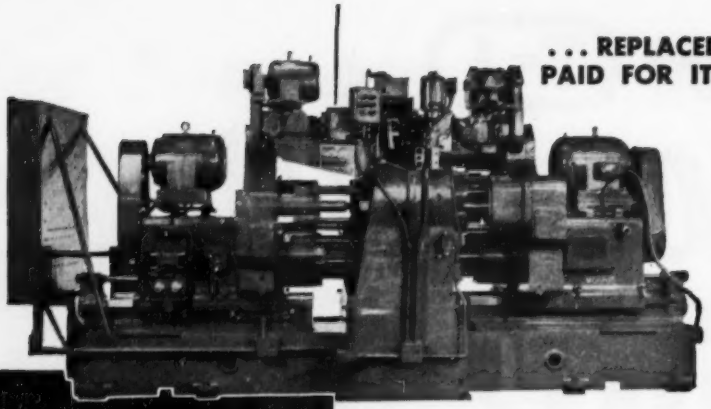

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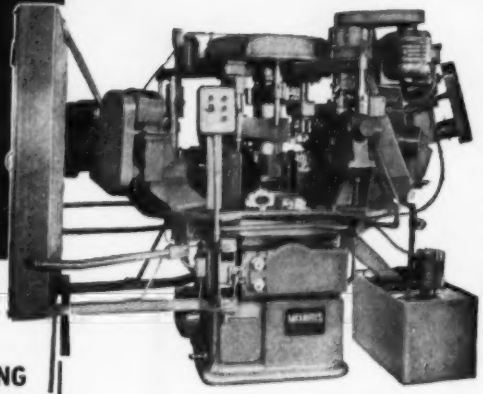
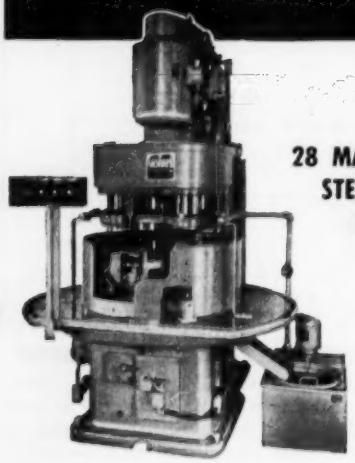
. . . 300 PIECES PER HOUR!



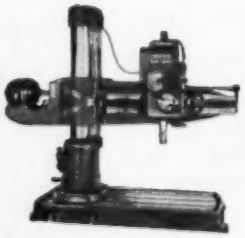
Either right or left hand carburetor air horns are drilled, faced and tapped . . . 22 operations . . . at a production rate of five per minute on this Six Station, Vertical Center Column Machine.



28 MACHINING STEPS IN 18 SECONDS!

Drilling, countersinking and reaming torque converter pump hubs, this Six Station Automatic Indexing Machine turns out 200 pieces per hour for a noted auto manufacturer.

Eliminate multiple handling and multiplied cost in multiple drilling, reaming, tapping and similar operations with Morris MOR-SPEED Production Machines. Morris Engineers will gladly prove that high precision production can be yours . . . with worth-while savings in time, labor and space. Write for additional details.



Morris also builds a line of 9 and 11 inch Column Radial Drills with outstanding features contributing to easy operation, sustained accuracy and long service life. Catalog on request.

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THE MORRIS MACHINE TOOL COMPANY

933 HARRIET ST., CINCINNATI 3, OHIO

American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

We've Never Had It So Good

Business is booming. All general business indexes are at a peacetime peak. Late last year, Metalworking spurted unexpectedly to a new peacetime high.

Manufacturers both in and out of Metalworking intend to make huge outlays for new plant and equipment the next 12 months.

Even with the several stretch-outs in the defense program, armament production is just beginning to roll. It will be in large volume this year and next.

At no time in history have so few workers been unemployed in relation to the total population. There is a labor shortage, particularly for skilled workers, professional men, engineers and scientists.

ALMOST ANY WAY you want to look at it, things at the moment have a rosy glow. People have more income than ever before; and they are spending freely.

On top of this tangible evidence that business is riding high is the sudden national about-face politically. Few metalworking executives today have ever operated under a Republican administration.

From now on, a different and more favorable business climate will exist. In its attitude toward industry, the federal government will be at least neutral, if not sympathetic. That will be in happy contrast with the prevailing attitude the past 20 years.

This fundamental change is likely to have far-reaching effects upon tax policies, upon profit possibilities, upon willingness to invest in new capital expenditures the next few years.

THINGS ARE SO GOOD that it is easy to become complacent and self-satisfied.

That is exactly the time when trouble usually begins. It is a good time to be on the alert, to look into all phases of your business, to develop new products against the day when competition will be knife-like, to be ready to make your products at the lowest cost.

This kind of realism has taken hold in the automobile industry. A good old-fashioned battle for supremacy is beginning. Such a battle has not occurred since the 1930's. It promises to push retail sales and production up to a level surpassed only once before.

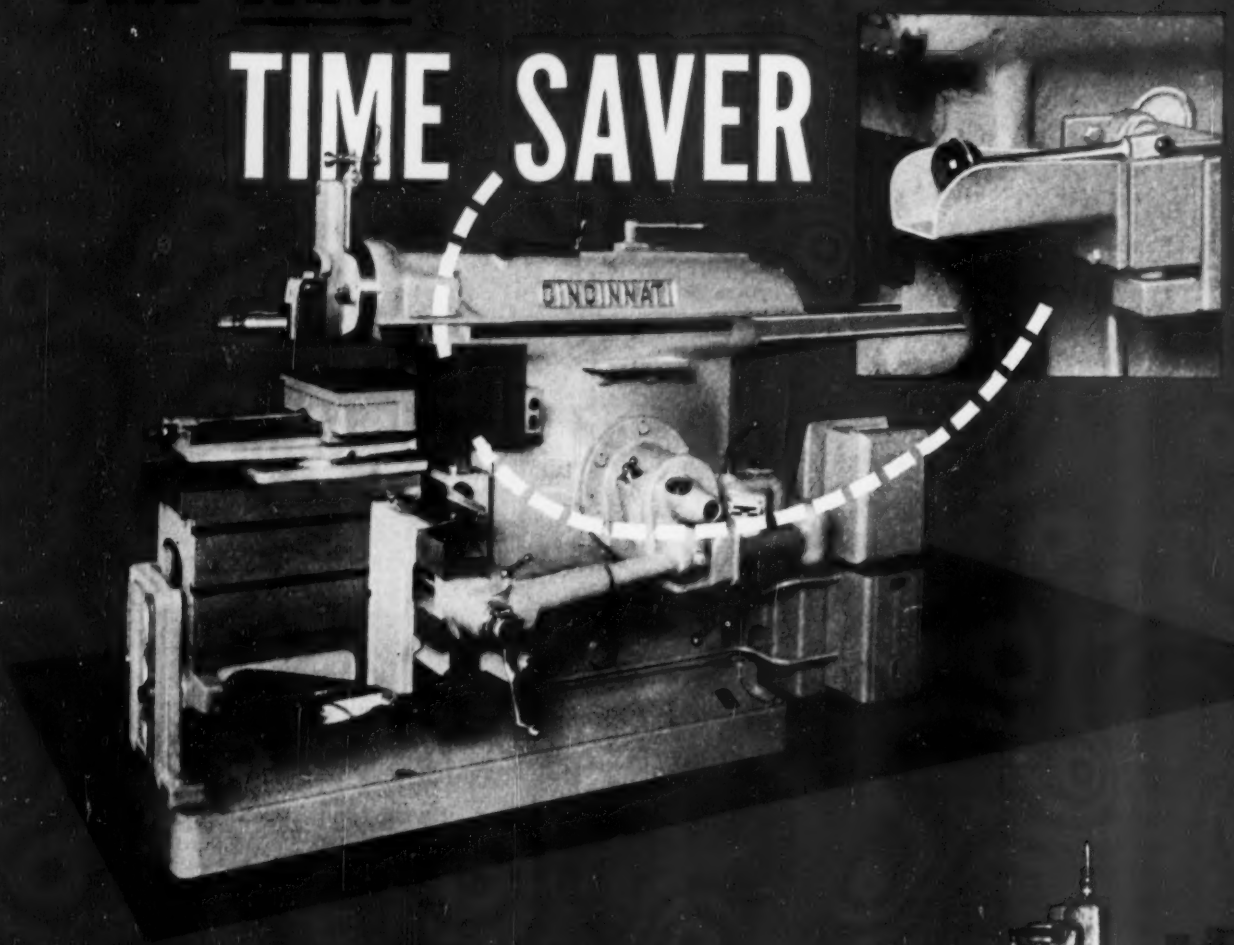
Remember that the automobile makers anticipated the situation now facing them and have been preparing for it a long time. They have developed new engines and new cars and tooled their factories with new production equipment.

The point is that the best way to keep the prosperity that we now enjoy is to work hard to make sure that it stays with us.

Burnham Finney

THE NEW

TIME SAVER



The New Cincinnati Electro-Magnetic Clutch and Brake alone brought a 30% time-saving here. ...

Starting and stopping are always non-productive, but where starts and stops are numerous and cutting time is a very small part of the entire work cycle—they become a serious time waster.

The New Cincinnati Magnetic Clutch and Brake, with its single, convenient control lever, converts wasted time into productive time. It gives the operator the fastest, simplest and most accurate control of his Shaper.

This powerful clutch and brake requires no shutdown for adjustment, and has a long, maintenance-free life. Time-saving and profitable features.

Write for Catalog S-5 for the complete line.

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THE CINCINNATI SHAPER CO.

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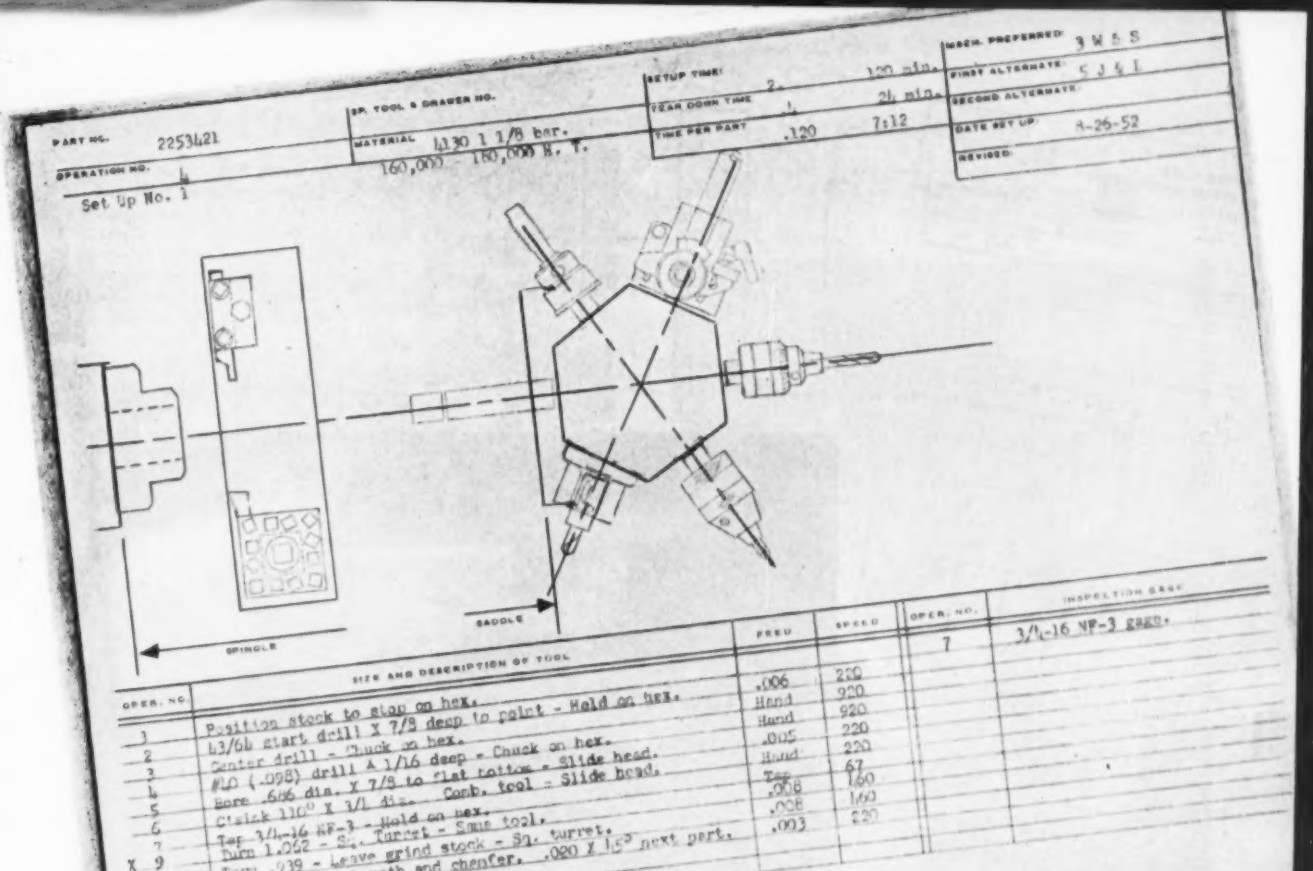

PART NO. 2253421
OPERATION NO. 4
Set Up No. 1
SP. TOOL & DRAWER NO.
MATERIAL 4130 1 1/8 bar. 160,000 - 180,000 R. T.
SETUP TIME 2 120 min.
TEAR DOWN TIME 1 24 min.
TIME PER PART .120 7:12
MACH. PREFERRED 3 W & S
FIRST ALTERNATE S J & L
SECOND ALTERNATE
DATE SET UP 8-26-52
REVISED
SPINDLE
SADDLE
OPER. NO. | SIZE AND DESCRIPTION OF TOOL | FEED | SPEED | OPER. NO. | INSPECTION GAGE
1 Position stock to stop on hex. .006 220 7 3/4-16 NF-3 gage.
2 43/64 start drill X 7/8 deep to point - Hold on hex. Hand 220
3 Center drill - Chuck on hex. Hand 920
4 #40 (.098) drill X 1/16 deep - Chuck on hex. .005 220
5 Bore .686 dia. X 7/8 to flat bottom - Slide head. Hand 220
6 C'sink 110° X 1/1 dia. Comb. tool - Slide head. Tap 67
7 Tap 3/4-16 NF-3 - Hold on hex. .008 160
X 9 Turn 1.062 - S. Turret - Same tool. .008 160
X 8 Turn .439 - Leave grind stock - Sq. turret. .003 220
10 Cut off 15/16 length and chamfer. .020 X 45° next part.
Surr - use rear tool post.
REMARKS X Carboloy

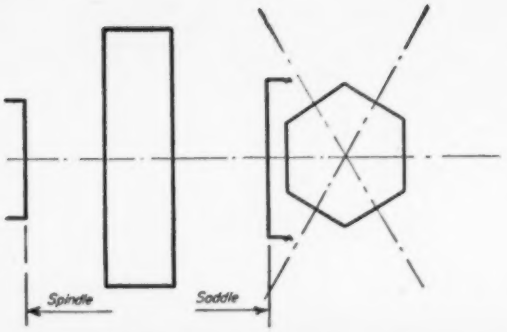
THIS 9 X 12-IN. SETUP CARD is the key to the system. It shows a view from above of the spindle and saddle, with proper tooling rubber-stamped in proper locations. It also lists and describes operations and tools, shows feeds and speeds, setup and teardown time, time per part, and material. Times are shown as fractions of an hour for record keeping and in minutes for the operator. At the upper right-hand corner is the preferred machine, with alternates to assist in scheduling in case one machine type is tied up. Cards go in a protective envelope with the print and tooling to the operator, are filed after runs for re-use and reference

with this shop-devised planning and control . . .

EVEN UNSKILLED OPERATORS SET UP THEIR OWN MACHINES

A sketch, produced with rubber stamps on the setup sheet, pictures proper tool arrangement, while the sheet lists operations, and proper feeds and speeds, setup and teardown times, as well as time per part and preferred machine. Foremen can schedule work and machine, while Production Engineering can control operations and rate departments for efficiency

BY P F YOUNG,
Assistant Supt, Machine Shop, TEMCO AIRCRAFT CORPORATION, DALLAS, TEXAS



BASIC SKETCH of turret-lathe tool area looks like this before stamps are applied. Note how center lines are extended to center stamps. In effect, only spindle nose, cross-slide, and turret are shown

MACHINE SCHEDULING is done from 3½ x 8½-in. job-time cards, made up from the setup cards. In addition to identification, they show number of parts required, repeat setup, tear-down, and standard times, have spaces for hours, operator, leadman's OK. Priority is indicated by numerals at top (IW is in work, C is completion date), or by flagging. The scheduler can file these cards by machine type and further by actual machine, can reshuffle them easily if conditions change

To increase efficiency of machine loading and setup at Temco Aircraft Corporation, we have devised a system with several unique characteristics. The system permits central control of these functions, permitting operators and leadmen to produce parts rather than hunt tools. Tools are selected and grouped by an experienced tool man, delivered with setup instructions to the machine before the setup is changed, and checked over and sharpened afterward ready for reuse. The system permits central inventorying of tools also. All these characteristics are desirable, but not unique.

The unusual elements in our new system are these:

1. The operator is given an actual sketch of the setup, produced by rubber-stamping a basic layout. He also is shown proper feeds and speeds for each operation, so he can actually "follow the picture" to set up his own machine.

2. Proper feeds and speeds are set by an experienced man — the tool planner—and can be refined as experience dictates, based on centralized records. Troubles that develop can also be noted and avoided later.

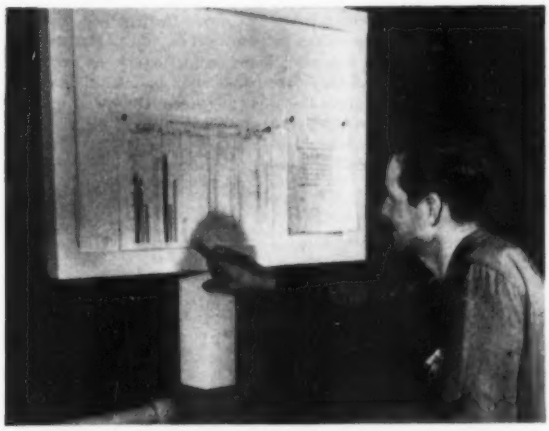
3. The experienced men can be used where their experience counts most. Less-skilled help can handle setups, and actually train themselves as they work. This is important in our area, where skilled men are scarce.

4. The system is set up and administered by the department concerned, rather than by some overriding group. This helps morale and reduces misunderstanding.

Installation of the new system proved to be quite easy and it has proved simple to administer. Essentially, it works this way:

Operation sheets are received at the machine setup and loading control station, near the toolcrib. If a setup card has been made previously, this is taken from the files and the new data recorded on it. If not, a new setup card is originated by the assistant planner concerned. Then the operation sheet goes on to the warehouse to authorize withdrawal of the stock. Meantime, the job-time card is prepared and the setup card and print are placed in a 9 X 14½-in. clear-face protective envelope. The job-card is turned over to the parts-control scheduler. He schedules it, preferably not over 24 hr in advance, in the preferred machine group, or if

THIS SMALL ROOM handles all planning and setup control. Rubber stamps and data for turret-lathe jobs are centralized at the desk at right rear, those for the miller at right front. Each desk is occupied by an assistant planner, a skilled former operator of the type of machine he is scheduling. Between them is a clerk-typist, and at rear left the setup planner. Files are at left front



WITH STANDARD TIMES ASSIGNED and many jobs that run through both shifts, it is possible for industrial engineering and production planners to determine efficiency for each department shift. These are posted daily (shown here is the sheet for the lathe section for two days) and result in much of rivalry between sections and shifts

ALL TOOLS AND EQUIPMENT shown on the setup card are taken from toolcrib shelves and placed in a large Stackbin with the card and job print in a protective envelope. This is stored in the crib. When the leadman notifies the crib that a machine will be available in 15 minutes, he also indicates what job is next. Tooling is trucked directly to the machine, and stock sent over from stock stores

that group is overloaded, in the first or second alternate group. He also sets priority, based on critical shortage, on assembly priority, or wanted dates, considering subsequent operations, manhours required, and other factors.

The setup card goes to the tool-preparation man, who assembles required tools in a 9 X 12 X 16-in. Stackbin and stores them ready for release. When the leadman or supervisor advises that a particular machine will be free in 15 min., tooling for the next job is taken to that machine. The operator, assisted by the leadman, sets it up, and gages the first part as indicated on the setup card. The leadman also checks the first part and OK's the setup on the job-time card.

When a run is completed, all tooling and the card goes into the Stackbin for return to the control station. There the assistant planner checks against the setup card, also singles out any tools requiring sharpening or other maintenance, then returns the bin to the tool crib. Incidentally, operators grind only cutoff tools and HSS toolbits; all carbide tooling and cutters, drills, etc, are ground in the crib only.

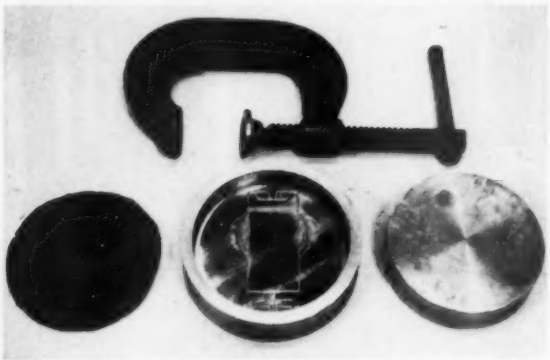
Obviously, the setup card is the key to the system. It is, therefore, prepared with extreme care by competent personnel; it is *not* a clerical job. The assistant planner fills in the sketch. He shows material (to indicate tool material) and method of holding, dimension from collet nose, chuck face, or fixture to end of material and to saddle. All tooling is shown, with dimensions where a shoulder or flange, etc, does not locate them. Part, operation, drawer, and tool numbers are marked on feeds, and speeds shown are worked out in cooperation with Industrial Engineering. Gaging data and gages are checked with the Inspection Dept, rechecked between shifts. Every effort is made to keep all cards up to date and to adjust times, feeds and speeds in accordance with developments in the art. Cross-checks are made between similar jobs for this purpose as well. Details of various steps are pictured here, as well as the method of making the necessary stamps and typical types.

The card and system thus are a constant control on methods and production as well as an aid to training and morale.

FOR STAMP DESIGNS, AND HOW THEY'RE MADE, TURN THE PAGE . . .

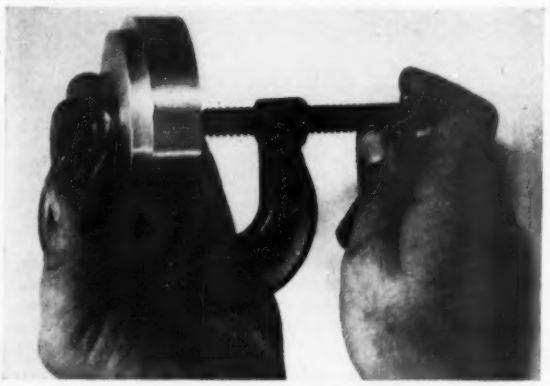
YOU CAN MAKE YOUR OWN STAMPS . . . TO LOOK LIKE THESE

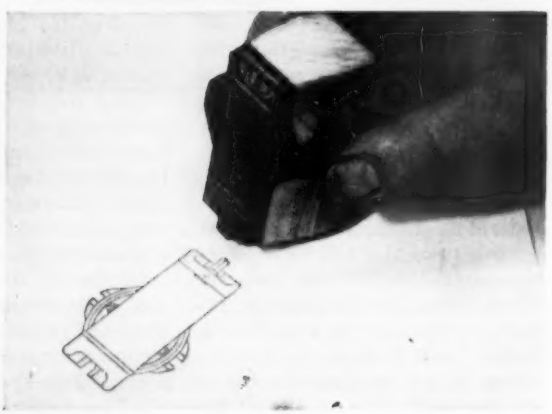
1 . . . A simplified drawing of the tool or attachment is made, seven times scale size, on drawing paper. This is mounted on a tempered Masonite slab, the lines are routed with a ball-end mill to about 3/32 in. wide and deep enough to guide a follower stylus. Hand guiding is close enough. The finished templet is mounted on a Gorton engraver, and the design routed, one-seventh templet size, on an aluminum or steel disk about ⅛ in. thick, with a regular small bit. Side taper will give the stamp strength



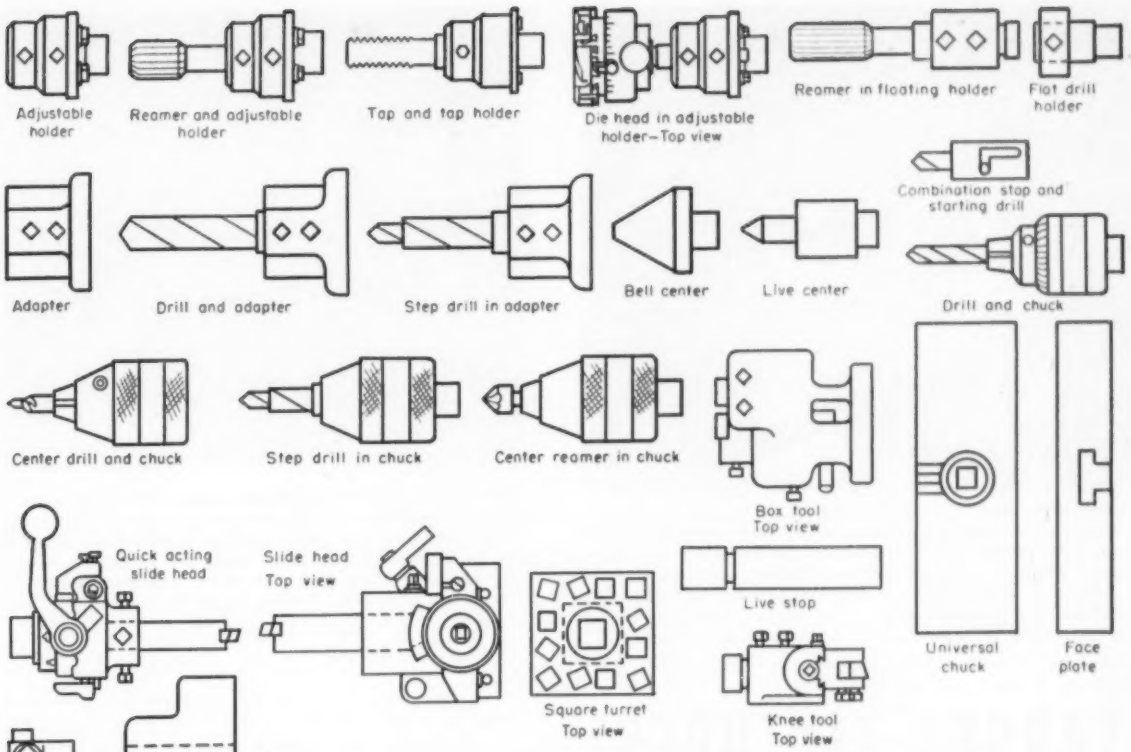
2 . . . Disks of aluminum or steel are made to fit either of two aluminum cups, size being chosen to clear over-all size of the stamp being made. Reduction in engraving hides templet errors, yet permits as much detail as is necessary for identification or instruction. Engraved disks are lightly ground or filed to remove engraving burrs. Here all parts are shown, the engraved disk in its cup, the disk of ordinary tire-patch rubber that makes the finished stamp, a thick cover disk for the cup, and a common C-clamp

3 . . . The engraved disk is placed in the holder bottom, with the section of tire patch over it, and the thick cover plate on top. Then the C-clamp is applied and pulled up tight to force rubber into the engraved lines (to "fill the molds"). This assembly is put into an oven at 300F for 45 min. to cure the rubber, then removed, allowed to cool, and the vulcanized rubber stripped from the mold

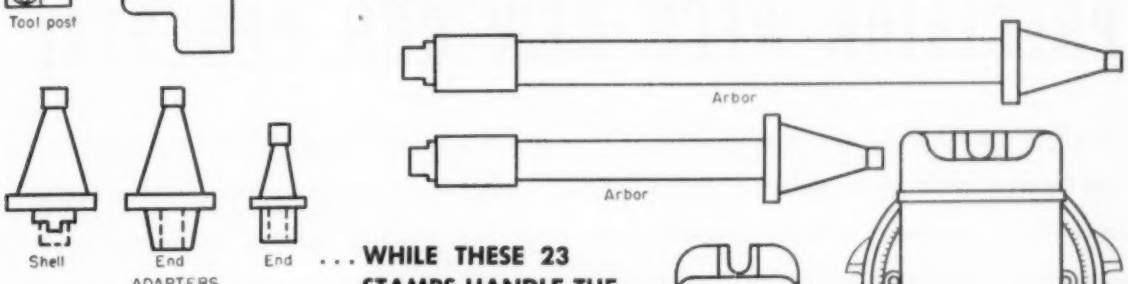




4 . . . The tire-patch stamp is cut out of the disk and glued to a foam-rubber sheet ⅛ in. thick. This in turn is cut to shape and glued to a wood block. 3M cement EC870 or block is used. The block is trimmed to shape (usually by sawing, then grinding), and even provided with thumb grooves if desired. Ends are sanded with particular care and center lines indicated, so the stamp can be located properly on the setup sheet, as at left. A proof of the stamp is pasted on its back for ready identification

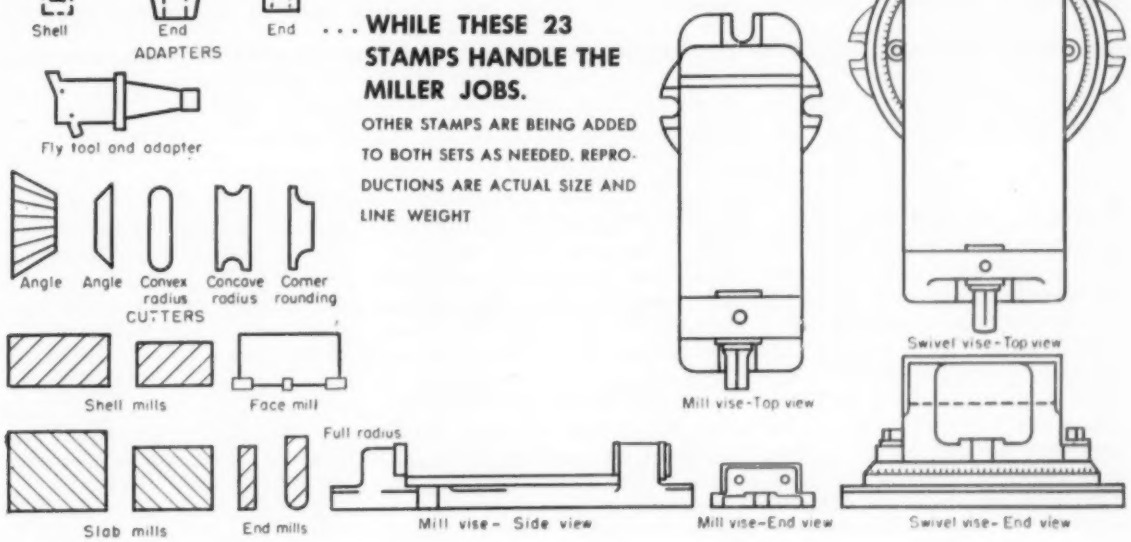


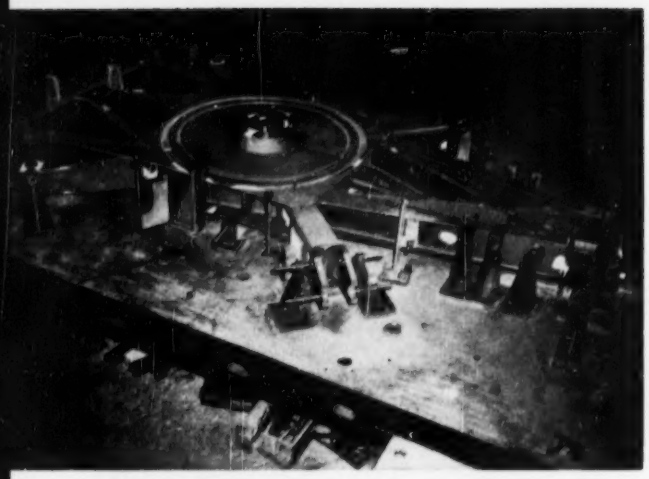
THESE 26 STAMPS HAVE BEEN MADE THUS FAR FOR TURRET-LATHE SETUPS . . .



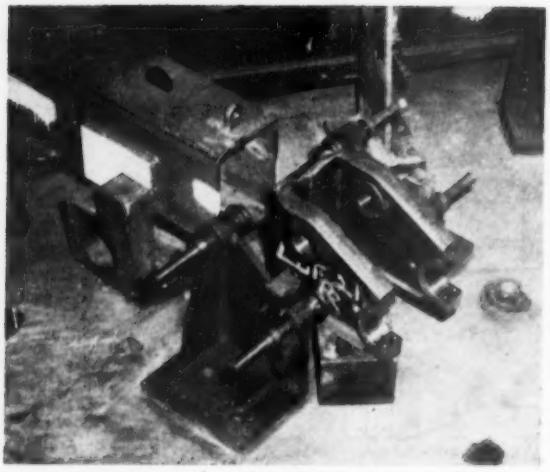
. . . WHILE THESE 23 STAMPS HANDLE THE MILLER JOBS.

OTHER STAMPS ARE BEING ADDED TO BOTH SETS AS NEEDED. REPRODUCTIONS ARE ACTUAL SIZE AND LINE WEIGHT





TARGET FIXTURES mounted on heavy platen accurately locate finish-machined pieces for tack-welding to pedestal of Army's new 75-mm anti-aircraft gun. Piece in foreground is outrigger pivot, which has bearing surfaces machined to 0.001-in. tolerance. Through use of target fixture, piece is held in accurate relationship to other surfaces of pedestal that are machined in subsequent operation. Pedestal first is assembled in another fixture, then is transferred to this fixture for assembly of all finish-machined components



FINISH-MACHINED PIECE (outrigger pivot) is in approximate position for mounting in fixture. Projection on front of pivot is fitted into box section of pedestal in such a way that four plugs in fixture can be inserted into finish-machined bearing surfaces of pivot. Target fixture locates pivot in exact drawing relationship to centerlines of pedestal. Pivot then is tack-welded

TARGET FIXTURES PRECISION-WELD NEW GUN PEDESTAL

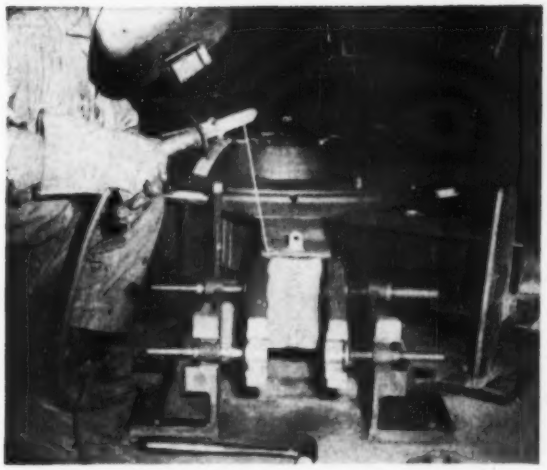
Precision-machined pieces now are welded to unmachined pedestals at the Watertown Arsenal. Target fixtures locate pieces precisely during welding so machined surfaces are in accurate relationship to surfaces machined in later operations. By closely coordinating welding and machining methods, Watertown cuts layout time, reduces rework, and minimizes the over-all production cycle

BY E C PEARSON, Chief of Manufacturing, and FRANK GEORGE, General Foreman, Structural, Watertown Arsenal, Watertown, Mass

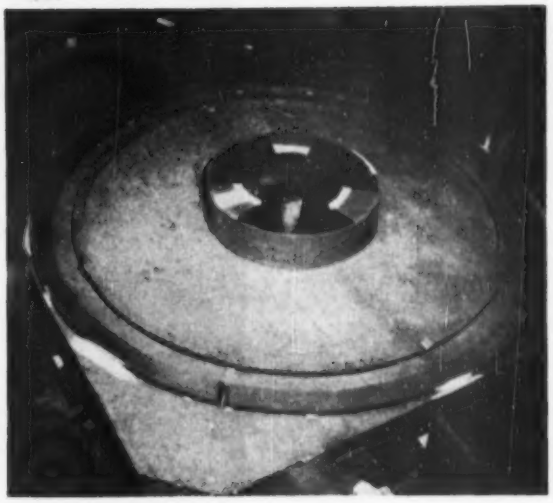
Pedestals for *Skysweeper*, the Army's newest and most advanced anti-aircraft gun, posed a number of difficult production problems for the Watertown Arsenal. Outrigger pivots, for example, required precision machining on surfaces that were hard to reach once the pivots were attached to the pedestal. Several other surfaces also required tedious, time-consuming operations if the pedestals were to be produced by the conventional weld-assembly methods.

To overcome these problems, Watertown developed a technique for welding finished-machined components to rough weldments. Pivots and other pieces now are machined to size at high rates of production on standard equipment, then are welded in target fixtures to the rough structure of the pedestal. When this structure is finish-machined, the pivots and other pieces machined before welding are in exact dimensional relationship with all other machined surfaces of the pedestal. No additional machining after welding is required on the previously machined pieces although the tolerance is only ±0.010 in. on the dimension from the center of the pedestal to the center of the pivot bearings. This distance is approximately five feet.

Targeting not only eliminates difficult machining operations on



TACK-WELDING of outrigger pivot is performed with target fixture providing complete dimensional location. Plugs have shoulder that locates against machined face of bearing hole and collar that engages dimensioning surface on target support member. In background, is target for hydraulic-cylinder mount (not shown in welding position). Targeting simplifies machining problems



PIVOTING GAGE aids setup of pedestal on platen. Pedestal is positioned so machining lines scribed on hub of pedestal during tack-welding in first assembly fixture match the arc described by gage as it is rotated about center post. Reference lines at other points on pedestal are matched in similar manner

the pedestal but also speeds production and reduces rework by insuring that weldments will clean up in machining, by equalizing stock removal on each surface, and by providing a fast, easy method of establishing machining lines on the weldment. Components are located so there is ample stock on all bosses and machining surfaces. Then, while the pedestal is still in the fixture, gages are employed to indicate machining lines on all surfaces. Slow, manual layout is eliminated and stock removal during machining is minimized.

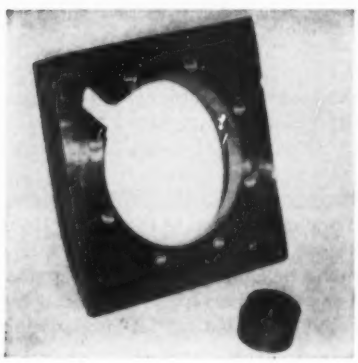
Assembly Sequence

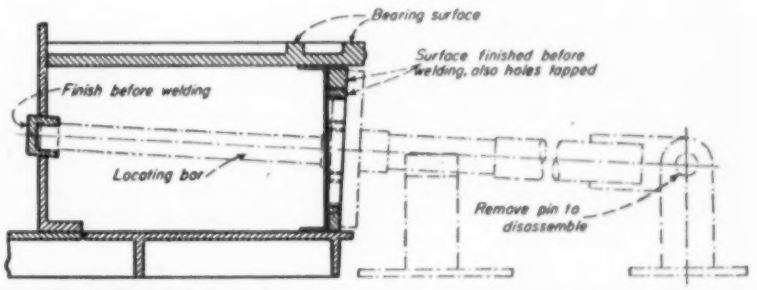
Final assembly of the pedestal is performed in two separate target fixtures. A number of subassemblies are brought together in the first target fixture and are tack-welded. After finish-welding in a different fixture, the pedestal is transferred to a second target fixture where all finish-machined pieces are added. This is done by tack-welding. Finish-welding of these pieces is performed later at a different workstation.

Setup Procedure

During setup, two horizontal centerlines are drawn through the center of the platen at 90° to each other. These are the reference lines from which all target fixtures are located. The pedestal drawing is dimensioned in the same way. Each target fixture is located on the platen according to the exact drawing dimensions specified for the piece that the fixture locates and supports during the tack-welding operation.

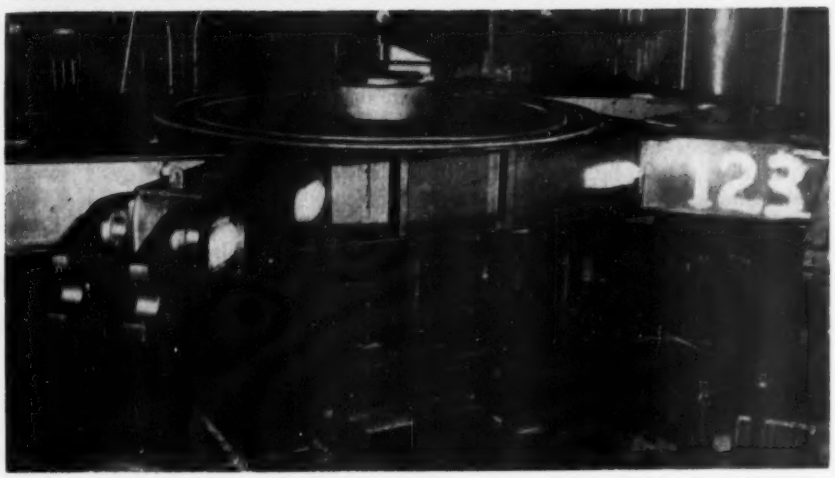
In production, matching centerlines are scribed vertically on both ends and both sides of each assembly that is tack-welded in the first fixture. All surfaces requiring machining, are checked to make sure that there is enough stock to clean up and that holes are in the center of the bosses. Machining lines then are scribed on the pedestal. This must be done in this fixture as the finish-machined pieces to be added in the next fixture must maintain the specified dimensional relationship with these machined surfaces. No re-layout or remachining is pos-





MOUNTING PLATE AND SUPPORT COLLAR for hydraulic lifting cylinder also are located for tack-welding by target fixture while in finish-machined condition. Pieces are welded to central support members in a position that is difficult to reach for machining operations. Pieces are attached to locating bar, which is moved into position and pinned

FOUR PORTABLE MACHINES are grouped around pedestal to permit simultaneous machining of several surfaces without need for special equipment. Machines are strapped to 40×60 cast-iron platen with intersecting T-slots. This method saves handling and setup time and greatly reduces over-all cycle time for job



PEDESTAL IS LOCATED from hub and top bearing surfaces. These were machined in previous operation with setup made to layout lines scribed on pedestal during assembly in first target fixture. Ends of pedestal are supported on jacks adjusted until top bearing surfaces are level

sible once the finish-machined pieces are attached to the rough weldment. While the pedestal still is in the first target fixture, a leveling line also is scribed horizontally at key points around the assembly.

Locating Machined Pieces

To avoid high heat in the target fixtures and for convenient positioning during the operation, finish-welding is performed in conventional rotatable fixtures. The assembly then is transferred to the second target fixture where it is positioned so the centerlines scribed while the pedestal was in the first fixture match with the centerlines of the second fixture. The assembly rests on three mechanical jacks which are adjusted until the piece is level. This is determined by matching the level lines on the piece to a fixed-height portable gage on the platen. As some distortion occurs during finish-welding, this leveling operation must be performed on all pieces.

As outrigger arms must be interchangeable, the outrigger pivot is a precision-machined piece. Bearing holes are bored and reamed to within 0.001 in. total tolerance. Faces are completely machined inside and out. Location of the pivot on the outrigger is at a fixed angular relationship to the centerline of the pedestal and at a given distance from the center of the pedestal to the center of the pivot bearings. It also must be level, square, and at the correct height. All of these requirements are provided by the target fixture.

Plugs which are a close fit in the bearing holes support the piece. A shoulder on the plug must be snug against the machined bearing face at the same time that a collar on the plug is in contact with a dimensional locating surface on the target support member. When the pivot is supported in this way, all dimensional requirements automatically are fulfilled. The target fixture has been setup in correct drawing relation to the center lines on the plates and the rough weldment has been located on center. The pivot, therefore, is correctly located for welding. A box-section joint is made.

Several other finish-machined pieces also are located by target fixtures. One of the most interesting is a mounting plate for a hydraulic cylinder that lifts the mount off its wheels when the gun is in firing position. Close alignment must be maintained between the piston of this cylinder and an operating sheave. One target fixture holds both the plate, which includes tapped holes, and a support collar at the same time. Two sets of these pieces are required on each pedestal.

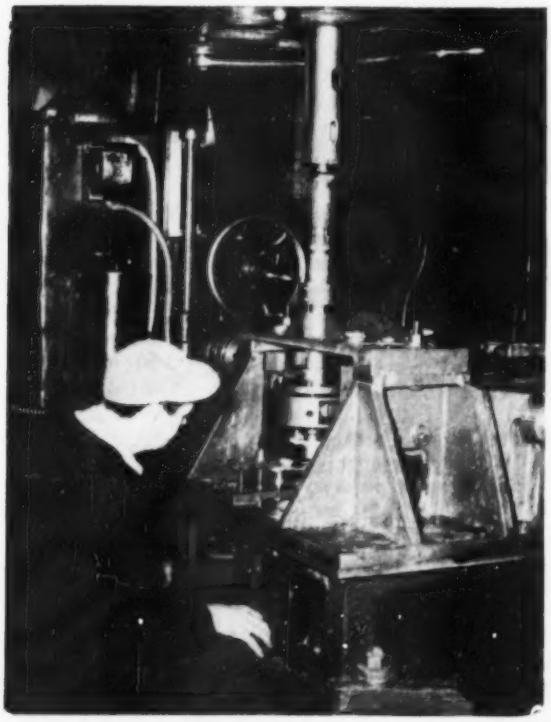
Multiple Machining Methods

To machine the pedestal in the shortest time, Watertown production engineers hit upon the idea of grouping four standard machines around the pedestal to perform several operations simultaneously. Handling and setup time are consideably reduced over what would be required for separate operations on each machine and the cycle time to produce each pedestal is shortened appreciably. Tooling is simple and required accuracy is maintained with less trouble than could be expected otherwise. In effect, special-machine output is obtained by effective use of standard equipment. No investment in machine tools was required and no time was lost waiting for delivery.

One boring mill and three radial drills, all portable, are clamped to a 40 × 60-ft cast-iron platen with intersecting T-slots. The pedestal rests on a center support and is located from its top bearing surface and hub. Both of these surfaces were machined in a preliminary operation on a horizontal boring mill. The pedestal, in this case, was strapped up and leveled on an angle plate to the original leveling lines scribed on it in the first target fixture. The bearing surface was faced and the hubs was bored to the machining lines originally scribed. From this operation on, all machining operations locate from these two machined surfaces, thus maintaining the dimensional relationship established in the target fixtures between the finish-machined pieces and surfaces requiring subsequent machining.

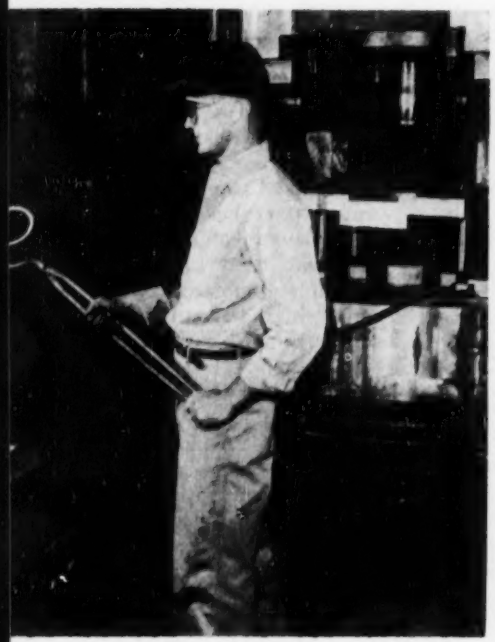
The pedestal is positioned on a center post and its ends are supported by jacks. These are adjusted until the bearing-ring surfaces are level. More than thirty operations then are performed to complete approximately 90% of the machining required on the pedestal in the one location and with the one setup.

Through application of sound tooling principles, Arsenal personnel succeeded in developing a welding procedure that had not previously been attempted in Ordnance production at Watertown and that is seldom atempted in production welding when precision machining is required on the final assembly. This plus effective use of available equipment resulted in a much shorter production cycle on an important item of Ordnance materiel.



MULTI-PURPOSE JIG at head end of pedestal guides tools during approximately 30 operations including drilling, tapping, boring, reaming, and facing. Tool shown provides cross-feed to toolbit permitting facing of top and bottom of hub with radial drillpress

SIMULTANEOUS OPERATION of radial drillpress and small boring mill is possible on multi-purpose jig. Line boring and reaming is performed to tolerances of ±0.001 in. Toolholders are supported in bushings on close-tolerance operations. Top plate of fixture is removable to permit other drilling operations for which bushings could not be inserted in plate



HEAVY DIES ARE NEEDED to resist cold-extrusion pressures, as is indicated by the 53-in. die shoe in this setup for cold-forming cups for the 4.5-in. rocket nose piece from zinc-phosphate-and-soap-coated steel billets. Until automatic handling devices are applied, two operators are needed to maintain production at this press

CONVENTIONAL DRAW DIES are used for finishing cups made by cold-extruding solid steel billets. First draw press has chute to deliver cups to unloading position from under push-through die. First and second draw dies each accomplish 35% reduction

PONTIAC COLD-EXTRUDES ROCKET PROJECTILES

One of the first successful applications of cold extrusion to the manufacture of steel parts on a production-line basis has been worked out by Pontiac production and tool engineers for producing 4.5-in. rocket nose pieces

BY BEN C BROSHEER, ASSOCIATE EDITOR

Backward cold extrusion—known as impact extrusion in the aluminum-goods industry, where the process has been used for many years to make toothpaste tubes and similar parts from small slugs or billets — involves several difficult probems when applied to steel. Pressures are very high—German data indicate that pressure exerted by the extrusion punch may range up to 330,000 psi—and lubrication is difficult. But the process makes possible economies which easily justify development costs.

Successful application of the process to production of 4.5-in. rocket nose pieces (projectiles) by the Pontiac Motor Division of General Motors Corp has resulted in elimination of many machining operations necessary in hot forging. After press forming, the cold-extruded, drawn and cold-nosed parts need be machined only in nose and base areas where threads are needed.

Pontiac production engineers responsible for the success of the rocket-nose line had to solve a number of difficult problems by trial-and-error, because there is so little information available. They deserve considerable credit for the fact that production equipment originally selected for the rocket-nose press line proved adequate, and only a few minor tooling changes were necessary.

The rocket nose pieces are made from 5 1/16-in.-dia, 12-ft long hot-rolled, spheroidize-annealed, pickled and oil-coated AISI 1012 to 1017 steel bars which are cut into 2⅜-in.-long billets with automatic Motch & Merryweather cold saws. Billet length is held within 0.020 in., but weight varies as much as 6 oz because of variations in bar diameter and roundness. Flat spots on bars also cause weight variations.

Billet Treatment

Billets are annealed at 1250 F by immersing for 20 min. in a molten-salt bath, then are shotblasted to remove mill and annealing scale. Studies now are being made to eliminate both operations, but for the present they are necessary to insure clean billets of proper physical quality.

Billets next are coated with a phosphate and dipped in a liquid soap bath maintained at 140 F with steam coils. Originally a higher temperature was used, but experience showed that more lubricant was needed for cold extrusion and the temperature was dropped so more soap would adhere to the phosphate coat.

Coated billets are delivered by conveyor to the extrusion press, where each billet is weighed and gaged for length, to insure that oversize billets are not put in the die. Punch or die breakage is almost certain if the billet is too large.

Backward cold extrusion is performed in a Clearing accentric-type mechanical press of 2500 tons capacity. Cold forming the 5⅞ to 6 in. long, 5 3/32-in.-dia cup with ½-in. wall and 9/16-in. base thickness from the 5 1/16-in.-dia, 2⅜-in.-long billet requires 1500 to 2500 tons pressure, and must be done in one continuous movement of the punch. If there is any hesitation in the movement of the punch during its stroke, work-hardening of the billet will occur and pressures sufficient to break the die ring and/or the punch will develop rapidly.

Reduction during cold extrusion is approx 68%, close to the maximum possible during cold extrusion of steel, according to German data. Base thickness is held within 0.030 in. When cooled, the extruded cup has a hardness of approx 100 to 105 Rockwell B (equivalent to about 22 R_c).

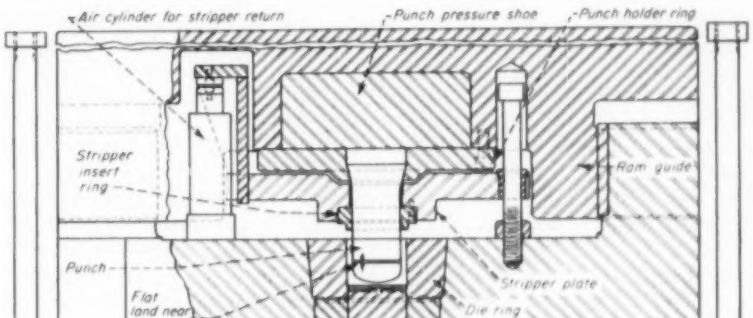
Shape of the punch and of the die ring are critical for proper flow of the metal in the billet under extrusion pressure. The bore of the 12-in.-OD ring is straight in the lower portion, for a distance equal to the height of the billet, then it is flared out with a 2° clearance taper. Likewise, the punch has a ¼-in.-long cylindrical land immediately back of the formed nose, then punch diameter is reduced approx 1/32 in. to clear the bore of the cup as it is extruded.

Experience during preliminary tryouts indicates that the extruded cup is heated by surface friction against punch and die surfaces, not by internal friction, so these tool parts are relieved as much as possible consistent with maintaining adequate strength. Even so, the cups are hot (400 to 500 F) when ejected from the extrusion die. But it is believed that this temperature can be reduced by proper tool design, because in tests cups have been extruded that could be lifted from the die with bare hands immediately after the punch was withdrawn.

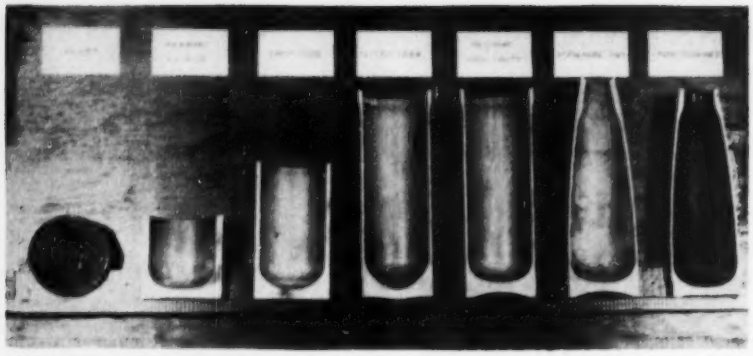
Punch Form

The form of the punch nose must be a compromise between that required at the bottom of the cavity to be formed and the shape that provides for the best flow of the steel as it is extruded to form the desired cup. German data indicates that the nose tip should have approx 5 to 7° slope from the radiused center of the punch, and this has been held in designing the punches for the 4.5-in. rocket nose piece.

The die ring is approx 12 in. in dia and 5 in. thick. It is pressed tightly into a 12-in.-thick, 53-in.-dia chrome-molybdenum cast-steel die shoe. The shoe must hold the ring tightly, so it can't expand and crack under extrusion pressure. A heavy press or shrink fit sufficient to contract the bore of the ring 0.005 to 0.010 in. is essential. The die ring in present use is made from Graph-Tung graphitic steel, selected because of its anti-galling



COLD-EXTRUSION DIE for rocket nose pieces has both stripper and ejector for clearing extruded cup from punch or die ring. Ejector plug is radiused at both ends to resist heavy pressures without upsetting and locking the piece in the cavity below the die ring



CUT-AWAY SECTIONS OF WORKPIECES (above) show operations required to make the 4.5-in. rocket nose piece when cold extrusion is used. The process minimizes steel required to make the parts, reduces the number of operations and machines required, and makes a better part. The process is certain to be applied to many other parts

characteristics. Like the punch, it is hardened to about 60 R_c.

A number of different tool materials have been tried out for making punches and die rings—but experience to date is too limited to permit definite recommendations. The present punch is made from 18-4-1 high-speed steel and was given a triple-draw treatment, a subzero cold treatment, and was liquid nitrided in an attempt to prolong its wear life.

Galling and scoring of surfaces contacting the cup as it is extruded from the billet seem to be the factors limiting punch and die life. Present tolerances on cup diameters permit ring and punch to be redressed several times before they must be discarded.

Extruded cups are annealed (1250 F for 20 min), recoated with phosphate and soap, then delivered by conveyor to the first draw press, a Clearing F-1250-48 eccentric-type vertical unit. In this operation, reduction is about 35%, wall thickness being reduced to approx ¼ in. and OD to about 4¾ in., while length of the cup is extended to 9 11/32 in. by pushing the cup through a hardened-steel die ring. The cup is returned to floor level through a curved chute for stacking in a skid box.

After reannealing (again, 1250 F for 20 min.) and recoating as before, these drawn cups are redrawn in a similar press—but this time the cups are pushed only part way through the die ring, then lifted out by an ejector pin. This leaves an undrawn section with ¼-in. wall thickness approx 1 in. long at the open end of the redrawn cup, now 4½ in. OD, 13¼ in. long with wall thickness closely approaching the 0.192-in. dimension specified. The heavier wall is left at the open end of the cup to provide the extra metal needed when forming the nose of the projectile.

Nose Forming

Open ends of the cups next are annealed by immersing them to a depth of 6 in. in a 1175 F salt bath for 20 min. This softens the open end for the heavy reduction during the cold-nosing operation without disturbing the physical properties of the lower portion of the projectile. Then cups are recoated.

Base end then is restruck with a bottoming punch in a vertical Clearing F-11000-54 mechanical press, and cold-nosed in a Clearing F-1350-42 eccentric press to form the long ogive. Nosing die has a Graph-Tung graphitic-steel insert, instead of the cemented-carbide insert commonly used in most HE shell-nosing dies. It has proved to have the desired wear and pressure resistant characteristics. Size and runout (eccentricity) of the rocket nose finish formed in this operation is checked at three points with a special gage using dial indicators, and is held within 0.005-in. total indicator reading (tolerance is 0.010 in.).

Finished parts then are stress-relieved at 900 F for 10 min. This salt-bath treatment can be varied slightly to maintain required physical characteristics—50,000 psi yield strength and 10% elongation.

Finally, base and nose ends are machined. Size and shape of cavity and ogive of these projectile parts are held with sufficient accuracy as press formed to eliminate the need for any machining. Yet finished wall thickness is held within 0.010 in. and weight of the part within 0.2 lb.

Annealing and stress-relieving operations are performed in conveyorized Newcomb-Detroit salt-bath furnaces, one being installed for each of the three temperatures required—900, 1175, and 1250 F.

Pontiac engineers responsible for these operations are the first to acknowledge that there is much more to be learned about cold extrusion—and they anticipate that changes will be needed in the present line as they gain more experience.

For example, they now are planning to add a cam-operated die-trimming operation after the second draw—because variations in bar-stock diameters as supplied by the mills make it impossible to cut billets within sufficiently accurate weight limitations. Many of the cups now being drawn are too long, and this is causing difficulties in nosing and machining operations. And they are continuing studies of the critical billet lubrication problem, a controlling factor in cold extrusion.

In addition, they are planning to add more conveyors, and to install specially designed work-handling devices to automatize the press lines making nose pieces and other parts for the 4.5-in. rocket. But, for the present, they are concentrating on keeping up with Army requirements for more and more rockets.

What About Unified Threads?

BY MARTIN RHOADS, GLENN L MARTIN CO

Adoption of the Unified Thread Standard by the United States, Canada, and the United Kingdom is causing some concern among manufacturers who may be called upon to employ this standard in their products. Actually, American manufacturers have nothing to worry about, because the new thread retains the regular 60° thread angle. The British will have more trouble, because their regular angle was 55°; they will, however, retain the radius at root and crest. But whether root and crest are rounded (British), or flat (American), will have no effect on interchangeability.

Unification, however, does present some important problems, and it is evident that a commonsense approach must be taken—rather than strict adherence—to avoid confusion and expense, especially to small operators during the change-over period.

The three most commonly asked questions are:

What is the difference between Unified and American National screwthreads?

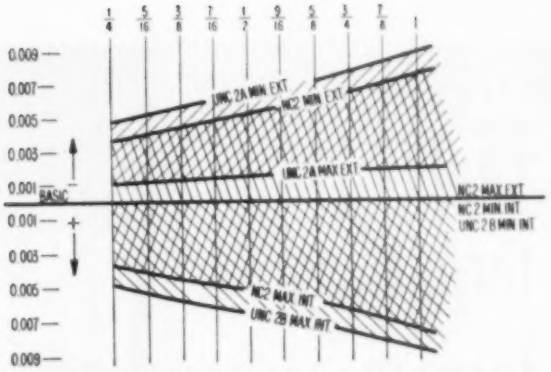
The only material difference with Class 2 and Class 3 threads lies in the minimum and maximum limits of the PD. The difference between the external limits of NC2 and UNC2A can be seen in the top portion of Fig. 1. (The letter A has been added to the Unified symbol to indicate external threads; the letter B to denote internal threads.) The UNC2A max external line has been changed to a less than basic dimension, and the minimum UNC2A dimension to a point below the NC2 minimum dimension. The tolerance is approximately the same, but an allowance (basic line to UNC2A max external) has been added.

On the bottom part of the sketch, the internal tolerance has been increased but the minimum dimension for UNC2B internal remains the same as for NC2 min, or along the basic line with no allowance provided.

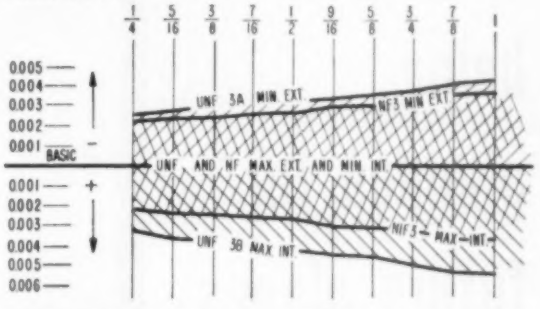
Fig. 2 shows the difference between external and internal threads of Class 3 fit for NF3, and UNF3A and UNF3B. For Class 3, no allowance is provided, but a small increase in tolerance on the minus side of external threads can be visualized, and an increase of 30% approx has been added to the maximum internal tolerance.

How does the Unified thread affect my present gage setup?

Because American National thread tolerances are within the limits of Unified thread tolerance, present gages can be used until they are worn out. They should then be replaced by gages set to Unified thread tolerances. For Class 2, the minimum roll on snap gages can be set farther to the minus side, or line UNC2A min ext. The maximum roll and "Go" thread ring gages should be set to the UNC2A max ext line



COMPARISON of Unified and National pitch-dia tolerances. Coarse thread, Class 2



COMPARISON of Unified and National pitch-dia tolerances. Fine thread, Class 3

in Fig. 2. This permits an allowance between male and female which is to the supplier's advantage in permitting easy assembly of both components.

The allowance will permit assembly of parts where external members are subsequently plated. The "Go" member of the male gage will remain the same, but when new "No Go" members are purchased they should be to the UNC2B max int limit. In Class 3, gages can be handled the same as for Class 2, except that the "Go" gage for external threads remains the same, and the tolerance increase of the internal thread is somewhat greater, approx 30%.

What happens to present components made to NC and NF tolerances when they are mixed with parts made to Unified standards?

It is clear, from Figs. 1 and 2, that parts made to one standard will be interchangeable with the other.

In the transition period, successful results can be obtained by cooperation between all departments. Engineers should call for Unified threads on all new designs, and should review all current specs and drawings for possible blanket changeover.

The procurement dep't should furnish the shop with Unified gages as old ones are replaced.

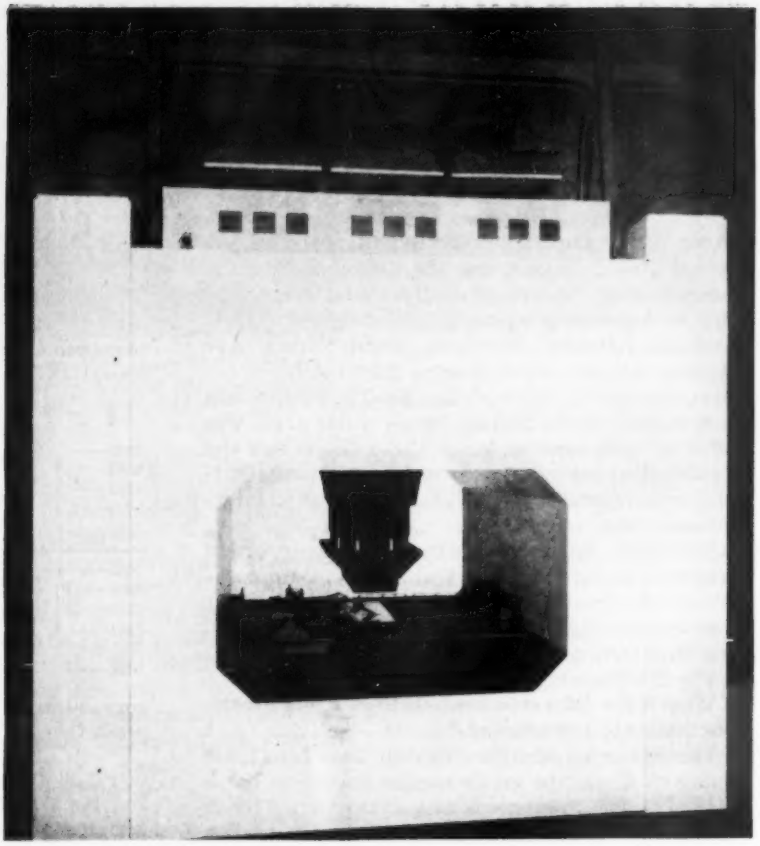
The inspection dep't should proceed with caution in rejecting parts made to old gages, as such parts could possibly be within Unified tolerances. In such cases, the parts would be acceptable.

The customer should use good judgement in analyzing difficulties arising during the transition.

If all parties apply themselves objectively, the new system can be inserted into present facilities with a minimum of confusion and expense.

75,000-ton throatless forging press being planned for future planes

BY RUPERT LeGRAND
ASSOCIATE EDITOR



MONOLITHIC center section of forging plant constitutes the throatless press. Weight of the thick concrete "roof," plus the side sections, power unit, and the press head, cylinders and slides will over-balance the forging pressure of 75,000 tons

New York — Through an entirely new design concept for hydraulic presses, the Air Force's future procurement of high-tonnage equipment is unlikely to be stymied by the physical limitations of conventional-press construction.

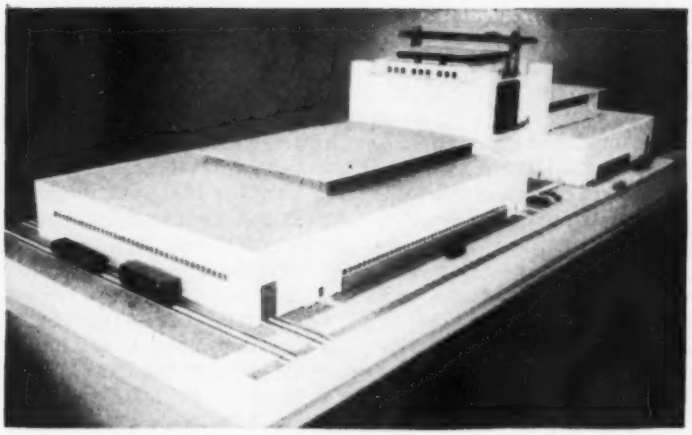
As tonnage goes up, the tierods or tension members of conventional hydraulic presses become so large that they drastically restrict the throat area, the die area and accessibility when placing the ingot in the dies and removing the forging. The practical upper limit appears to be 50,000 tons for conventional press design, considering work-space restrictions of the machine, the size and weight of shipable members and field-erection problems. One projected 75,000-ton press has been held in abeyance for these reasons. Another 75,000-ton press of conventional type may have merit. Nevertheless, the Air Force will probably need forging presses of up to 200,000 tons capacity to make the new type wing and fuselage members projected for future planes. The size and configuration of these members is beyond the foreseeable work-space capacity of conventional presses, even if they could be built.

Throatless Press Concept—If a hydraulic press can be built without a throat (no tension members connecting the press head and bed) full 360° accessibility to the dies is available. There is no need for massive bed and head members of tremendous beam strength, and the pressing area can be of any reasonable desired dimensions. Component parts of bed and head can be sectional, and therefore machined on existing equipment, and field installed without extreme difficulties.

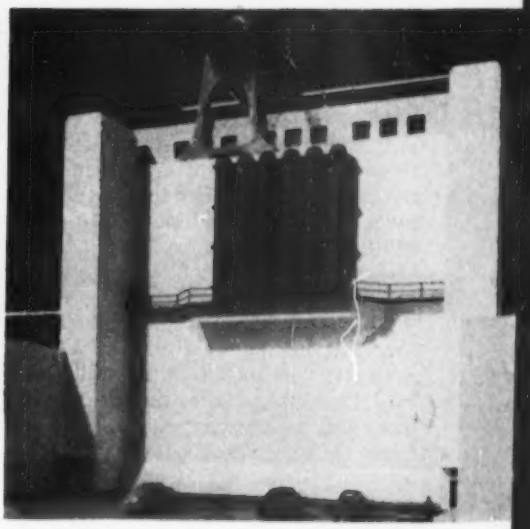
C A Van Dusen, managing partner of the Van Dusen Engineering Co, Escondido, Calif, started playing with the basic concept about 1946. He visioned installing the press elements in a huge cave and suspending the press head, cylinders and slide from the roof, but decided this was not a practical solution.

Preliminary Studies—Because of the nature of the problems involved, preliminary studies of the design, as related to a 75,000-ton press, have been made (*AM* — Mid-Nov, '52, pD9) by the Austin Company, Cleveland, and the Hydraulic Press Mfg Co, Mt Gilead, Ohio. Their studies show that throatless presses as large as 200,000 and even 300,000 tons now appear to be both practical to build and economically feasible.

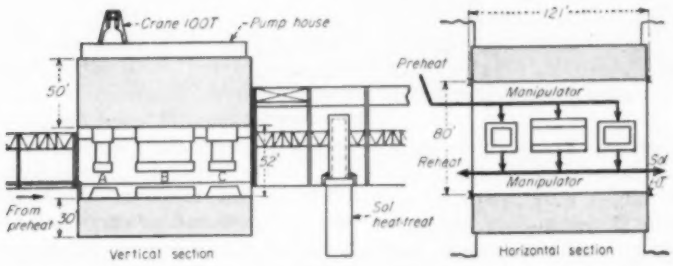
These companies are the joint owners of a new company, Throatless Press Co, which has been in-



COMPLETE PLANT would consist of left-hand low-bay area for stock receipt, preheating and reheating; the center section for the throatless press, and a right hand low-bay area for solution heat-treatment and machining



FRONT VIEW of the throatless-press section of the forging plant discloses that giant accumulator bottles are placed on a gallery and that the pump house and service crane are located on the roof. Elevators and stairwells at corners of the structure provide for service access to pumping equipment. Structure approximates twice the weight of the liner *United States*



PRESSROOM in monolithic structure might accommodate a cogging press *A*, the 75,000-ton forging press *B* and trimming press *C*. Complete 360° accessibility to the dies by absence of tierods, plus wide side aisle, will permit working the presses with two manipulators

PRINCIPALS in development of the throatless press are: C A Van Dusen, the inventor, and senior partner, Van Dusen Engineering Co; G A Bryant, president Austin Co, and John M Dolan, vice-president and general sales manager, Hydraulic Press Manufacturing Co

corporated in Ohio for the express purpose of carrying on the development work and handling any contracts which may be awarded for press installations of the throatless type.

Several frame configurations are being studied and the best one will then be selected as the basis for further development. Allowable bearing pressures on the concrete will be determined. Stress analysis of frame will be made and deflections under working loads determined. This work can be completed in less than 8 months, and it is expected that a plant could be built and equipped in 18 months. Entire cost of the complete plant would be substantially less than for a conventional 75,000-ton press with comparable auxiliaries, erected on foundation and with inclosure.

Concrete Frame — Prestressed concrete, a field in which Austin Co has pioneered, would be used. Location of reinforcement would depend on outcome of model studies on stresses and deflections. Weight of the concrete mass, plus that of the press head, cylinders and slides would supply the counterforce to the forging pressure.

Dimensions of the inclosing concrete mass will not be finally determined until projected studies have been completed, but the model indicates an over-all height of 180 ft, of which 30 ft is below ground. The press room would have a clear span of 80 ft, a floor-to-ceiling height of 52 ft, and a contemplated length of 120 ft. The model shows a cogging press and a trimming press installed in the pressroom along with the forging press, but these auxiliaries might well be placed elsewhere. By slight extension of the pressroom, additional forging presses could be installed in the line.

By attaching the press head directly to the ceiling of the pressroom, short runs of HP piping (4500-5000 psi) can be made from the power units to the press, contributing to hydraulic efficiency. Pipe would pass through cored

holes in ceiling. Six accummulator bottles weighing 90 tons each would be mounted on the front and rear faces of the monolithic structure. A 100-ton crane above the power unit would serve to emplace and service 5-stage pumps of conventional American design and driven by a total of approximately 10,000 hp.

Optical Alignment

Alignment of press platen and bed will be maintained with an optical system built into the structure. Indicating and recording devices will show stresses and deflections in the concrete. Electronic means will control displacement relationships in each of the press cylinders.

Press Features—In accordance with original specifications issued by the US Air Force on a 75,000-ton press, the following accommodations would be provided: Front to back, 25 ft, right to left, 80 ft, die area 12 x 42 ft, daylight 9 ft; stroke 7 ft max. Operating pressures: high-pressure stage, 75,000 tons; intermediate, 50,000 tons; low, 25,000 tons; stripping, 2,250 tons. Press will handle largest ingots now available: 36-in. dia by 10 ft long.

Pressures in the ten cylinders can be individually controlled to apply force to the press platen in relation to part configuration. Maximum squeezing pressure is 27,000 psi. Design calculations are based upon handling loads off center up to ±2 ft with respect to short table dimension and ±4 ft with respect to long table dimension. Accummulators will supply sufficient water for one maximum pressure stroke of 15 in. and one return stroke of 36 in. at 25 cycles per hr. Operating speeds: closing, 120 ipm; pressing, 0 to 60 ipm; and return, 120 ipm.

Dies—Sectional dies will undoubtedly be used, and presumably they will be mounted in a die set to maintain impression alignment. Thus, unavoidable float of the pressing members will have no effect upon work quality. Complete accessibility will make it much easier to change dies than in the conventional heavy hydraulic press, and to manipulate forgings in the dies. Furthermore, the throatless feature allows suitable breaching that cannot be accommodated in conventional presses.

Absence of tierods means, too, that dies could be more readily inclosed inert-gas chambers in which to forge metals and alloys requiring such treatment.

Non-Forging Uses—Complete accessibility and great platen and bed areas will enable the press to be used for rubber-die and Hi-Draw techniques on material of considerable thickness and large area. For example, if thick rubber is confined in a "can," the rubber-die method can be employed to form plate up to ½ in. thickness at pressure up to 15,000 psi. Die quenching of flat-forged, indented panels to desired wing camber is another possibility. Forging of steel and titanium will be much easier than aluminum alloys.

Working the Press—Wide aisle space on both sides of the press (or press line) plus complete accessibility of the dies means that manipulators can load from any desired angle. Manipulators can be used in both aisles, as shown, one to bring work from the preheat furnaces, the other to return the part to the reheat furnaces or to convey a finished piece to the solution heat treat or machining facilities.

Ease of Manufacture—Unitized construction is planned for the main elements of the throatless press. No single piece will be larger than the head of a German 13,000-ton extrusion press. Therefore, all parts can be machined on existing facilities. Thus, no special machine tools or untried techniques will be needed for fabrication.

In contrast, the bed and head parts of conventional hydraulic presses tend to swell to enormous proportions as the tonnage increases. Throatless-press elements will be relatively simple, and will be employed as straight compression members.

Cheaper to Build

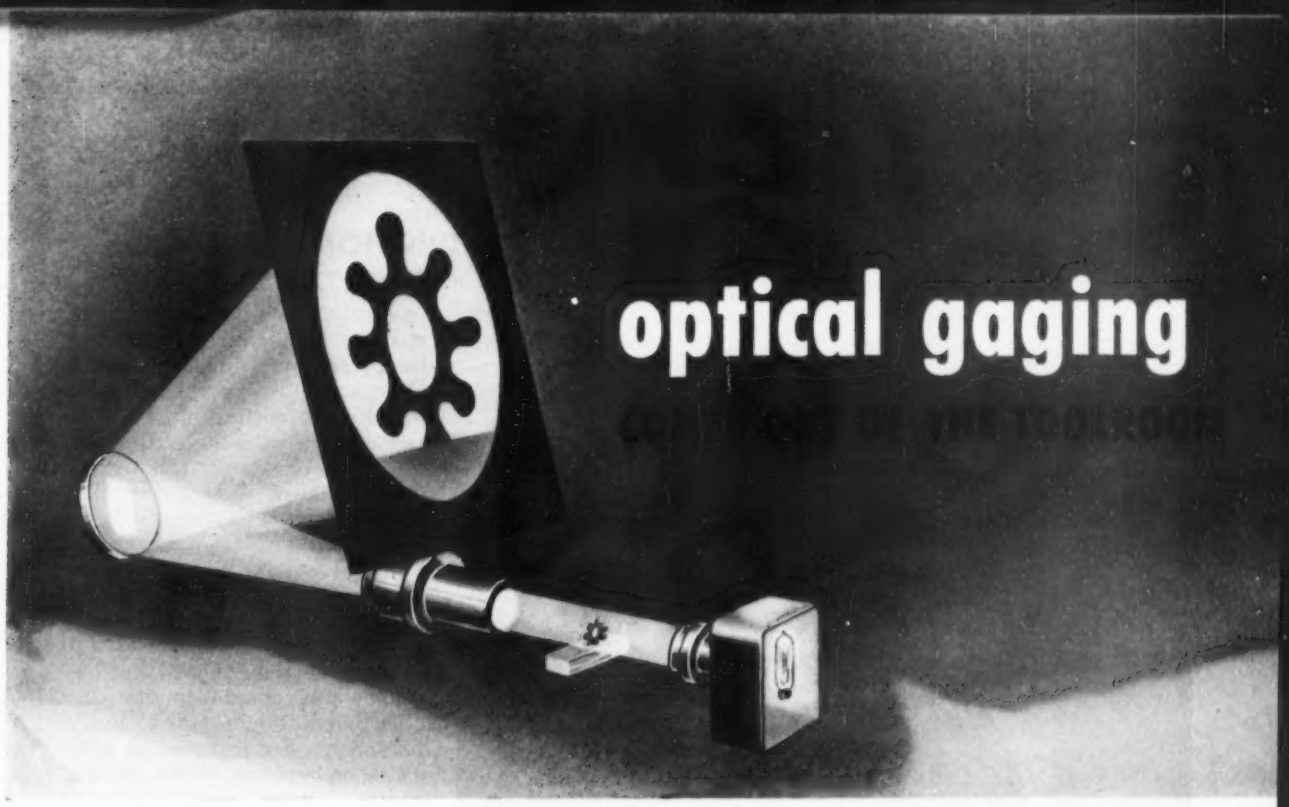
Unitized design means that the throatless press should be more economical to build and easier to ship and erect. Also, the bed can be extended and cylinders added in pairs to increase the tonnage or pressing-area capacity (assuming the concrete frame has a roof with large enough bearing area to distribute the thrust properly). It is believed that construction is one reason why the potential builders feel presses of 200,000 or even 300,000 tons are considered feasible.

Commercial Uses—The idea of the throatless press is not limited to huge-tonnage machines. It may be practical to build machines down to 5,000-ton capacity for use on forging or forming operations, and this should allow press forging of steel parts in larger sizes. A line of such presses could be installed in one frame. Low limit for size will probably be established by the minimum feasible thickness of the "ceiling" of the concrete frame. A certain weight of concrete must be used for each condition. However, the predicted cost of the 75,000-ton press with all supporting facilities is said to be very favorable, as compared to conventional hydraulic-press installations projected for the Air Forces' program. Because concrete is relatively cheap, the economies of the throatless press in commercial sizes also appear attractive. Thus, one could build a wide-span frame, put in one press first and add additional ones later.

Tips FOR TOP SHOP MEN

451 Basically wrong in many cases is the tendency to put the brilliant engineer or shopman in charge of training. He has scant sympathy for his less-gifted pupils, because he can't appreciate their difficulties in learning—he never faced them. He is likely to be impatient, and to consider the plodding mind a bore and a nuisance.

452 Don't worry if you're scared to tackle a tough problem. Remember that one of Napoleon's greatest marshals, looking down at his trembling knees before a charge, said: "Shake, will you? You'd shake more if you knew where I'm going to take you!"



optical gaging

BY GEORGE H DeGROAT, Associate Editor

MODERN gaging and inspection problems have taken the optical comparator out of the toolroom and put it into the production line. Individual pieces, subassemblies, recessed parts, and other work ranging in size from microscopic to actually too large and heavy to put on the comparator are now optically inspected quickly and easily as they are made. In this way, close control is maintained over manufacturing operations, and final inspection is made easier by using comparators in quality-control procedures later.

Optical gaging has many practical advantages, not least of which is the ease with which an operator can become familiar with the most complicated fixtures and charts. Unskilled workers can learn the requirements of optical gaging more quickly. The persistent problem of mechanical "feel" is eliminated, and there is no gage wear. Simplicity and reliability of duplication are other advantages. Any number of identical charts can be printed from a master, and even for the most complex parts, staging fixtures require duplication in only one or two of the most critical dimensions.

Part handling is held to a minimum because one staging operation permits complete inspection of many dimensions, thereby cutting down the possibility of damaged parts during inspection. Supervision is simplified because the comparator screen can be viewed simultaneously by two or more people. Expensive alterations are eliminated when changes are required, because tolerances and dimensions are easily adjusted on a chart by blocking out and rescribing the area affected on the master. Gage maintenance is almost negligible because there is little or no wear on staging fixtures and charts.

In this Special Report to readers of *American Machinist*, a variety of production applications of comparators is described. Short-run, "on-the-floor" inspection is covered, as are large-volume quality-control operations and special comparator setups at machines. It is based on visits to comparator-using plants as well as to makers of equipment.

American Machinist SPECIAL REPORT NO. 326 TO THE METALWORKING INDUSTRIES

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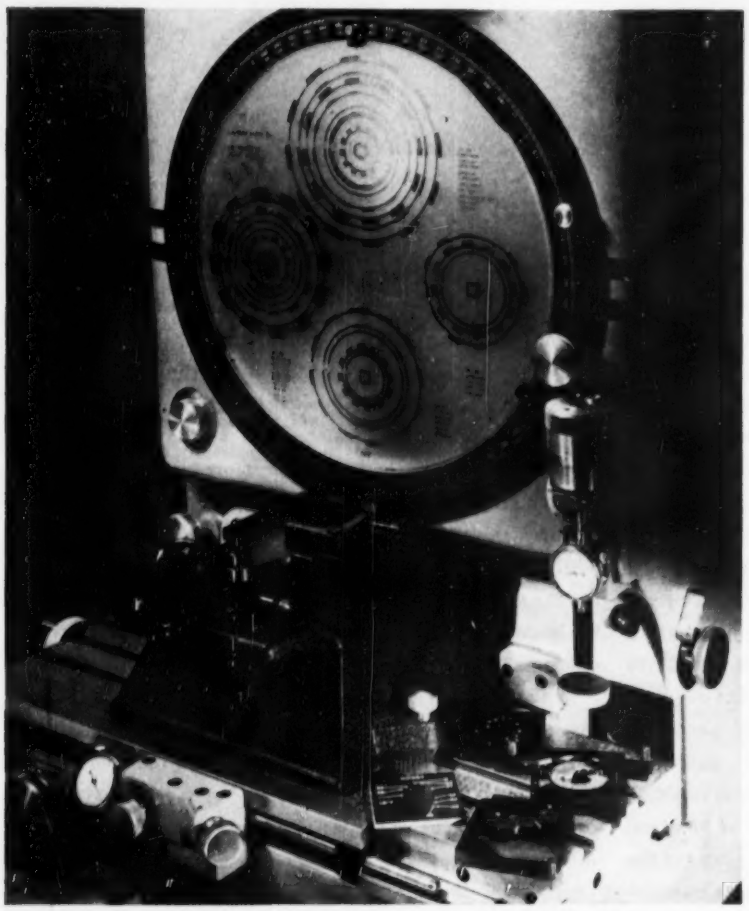
OPTICAL GAGING SIMPLIFIES, SPEEDS PRODUCTION INSPECTION

THREE separate but related elements combine to form a complete setup for optical gaging. First, a staging or holding fixture is required to support the part being inspected or adjusted; second, an optical comparator is needed to form a magnified image of the part on a translucent screen; and third, a master "chart" of the magnified image is superimposed over the image for visual comparison.

With the part to be inspected placed between a light source and a magnifying lens, a parallel beam of light is directed upon the part—the resulting shadow being magnified by the lens and projected to the viewing screen by a mirror. There the enlarged shadow image of the work can readily be compared with the chart or outline on the screen to check contour, dimensions and tolerances. To pass inspection, the shadow outline must correspond exactly to the outline on the chart, or it must fall within predetermined tolerance outlines. Surface illumination, a means of projecting the actual reflected surface of a part, is also extensively employed in optical gaging.



SPECIAL COMPARATOR CHART and shiftable staging fixture permit rapid checking of many different parts with varying hole sizes and hole patterns. Numbers on charted circles correspond to numbers on reference plate laid out with easily seen white dots that match hole pattern for a particular part. Pointer is placed over a dot on the reference plate, thus bringing an attached indexing pin mounted on the universal fixture into alignment with the corresponding hole in templet. This locates and positions the fixture table and therefore the work for projecting a particular hole to the screen where it can be compared for size with a matching hole on the chart. Special lines on chart form "optical bridge" for quick checking accuracy of hole size

Tolerances of 0.001 in. and smaller are quickly checked because lens magnifications increase small dimensions to easily read sizes. For instance, at 50X, 0.0002 in. becomes 0.010 in. on the screen. Charts with tolerance lines spaced 0.010 in. apart therefore permit readings of 0.0002 in. Even smaller dimensions are easily detected by an "optical bridge," a special method of arranging chart tolerance limits whereby variations in the part as small as 0.0001 in. can be seen several feet from the screen.

Simple, Precise Charts

Comparator charts are actually the "gage" in optical gaging. As previously mentioned, they contain accurately drawn or scribed outlines of the part being inspected, as well as dimension and tolerance lines. Made of any dimensionally stable transparent or translucent material, comparator charts may be temporary, semi-permanent, or permanent.

Temporary charts are often used for quick setups, short runs, or jobs that are non-repetitive. These are usually made in ink or pencil on glass-fiber tracing cloth or blank vinyl-plastic sheets commercially available in a range of sizes and thicknesses to suit various comparators and applications. Drawing numbers, part numbers or other systems provide a means of quick reference for such charts when they are filed away.

SIMPLEST CHARTS are often made by tracing projected image of a master part on the screen. Usually this is advantageous when very small non-repetitive quantities are involved. Comparator screens are safely cleaned with gasoline or benzol and a soft cloth

TOLERANCE LINES on this custom-made chart speed inspection of small, long-run production parts. Time required for inspecting one such part was reduced from 13 hours each by mechanical gages to ½ minute by optical gaging

For long-run jobs or repetitive work, more permanent charts are used. Often these are made on vellum cemented to plate glass. Here again, pencil or ink is used and sometimes inked charts are sent to a manufacturer to have duplicates made. In this way, gages are available for more than one comparator in other departments or in other plants using the same or different types of comparators.

Permanent charts of various kinds are made commercially of heavy plastic, ground glass, or combinations of glass and plastic. Standard charts are made in various magnifications and sizes to suit different comparators and they cover a wide range of thread forms and classifications as well as radii, graphs, grids, angles and others. Custom-made charts are extensively used, too, for particular jobs such as the gaging of involute-gear forms, ball races, gun and machine parts and jet blade, bucket, and root contours. Great care is employed in maintaining a high degree of accuracy in such charts. Usually a precise layout is machine scribed on special material, the resulting chart being kept as a master from which any number of duplicates are made.

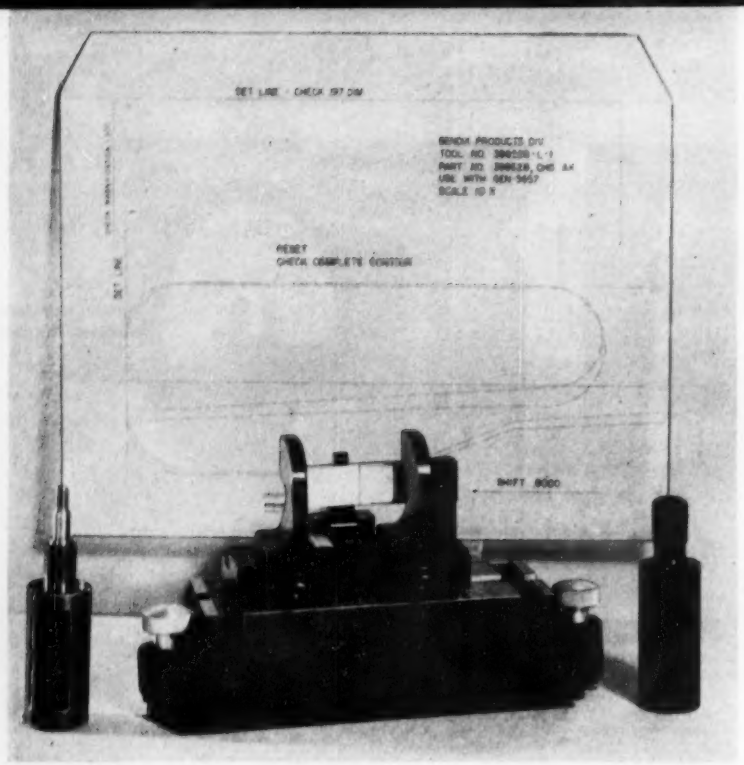
To speed gaging to split-thousandths, one manufacturer makes screens with double rows of alternately spaced, heavy, parallel rectangles. Inside edges of the rectangles comprising one line are coincident with inside edges of rectangles comprising the opposite line. In effect, this creates a line between them which is without width so the edge of a projected shadow can be brought into precise coincidence.

When dimensions are to be checked to closer tolerances than can be seen readily between two "go" and "no-go" lines on a conventional chart, this "optical bridge" principle is advantageously employed. In charts made with these special lines, light must be seen within indentations of accurate and known depth made in a heavy line. Depth of the indentation forms a "bridge" and is equal to "go" and "no-go" limits. When a part is oversize it excludes light in the indentation or bridge—undersize parts permit light to appear under the "footing" (balance of line alternating with indentations). Special charts are used for inspecting a wide variety of objects ranging from tiny watch gears to large form cutters and turbine buckets. They often permit complete checking of complicated parts which would be impractical to inspect by other methods. In at least one case, a special chart, combined with one special staging fixture, replaced 27 expensive mechanical gages.

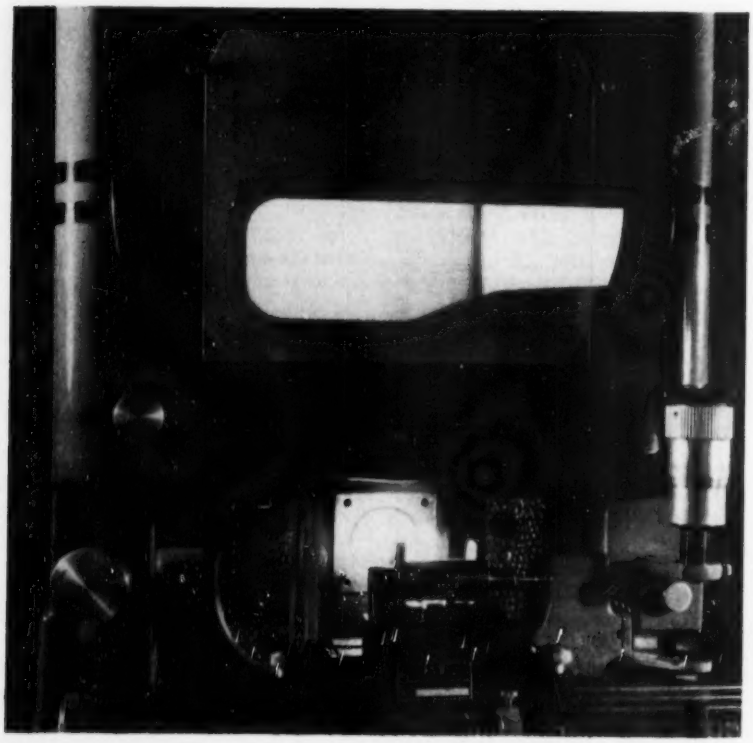
Other accessories that speed optical gaging are glass scales, one type of which confirms magnification settings of comparators. They provide a fast, accurate method of making direct measurements of projected images on the chart without moving the comparator table. Their advantage over metal scales for this purpose is apparent — the projected shadow can be seen through the glass scale. Similar instruments include glass layout protractors and projector rules.

Staging Fixtures Speed Inspection

There is a common misconception that optical gaging is



THIS CHART is scribed with contours of both ends of a part too long to be entirely visible on the screen at desired magnification. Contour being checked is elongated slot with irregular profile in valve part at left. Work is placed over a mirror on the fixture for reflecting light back to comparator mirror through slot



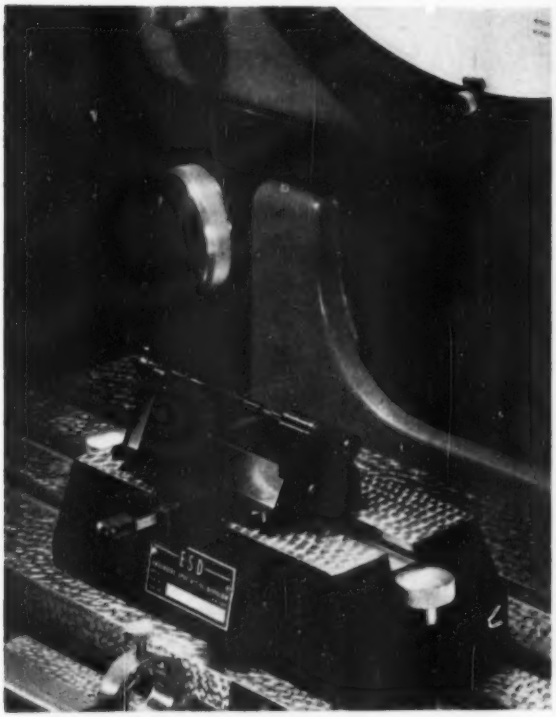
SURFACE ILLUMINATION and shifting fixture permits accurate inspection of irregular-shaped slot in valve part. When one end of part is aligned with "set" line on chart, tolerance lines indicate accuracy of contour at that end. Work is then shifted in fixture to bring opposite end into view on screen for checking with superimposed tolerance lines

limited to small, watch-like parts. Actually, it is entirely practical to inspect such things as the internal contours of 400-lb breech blocks, the odd sectional profiles of a plowshare blade, the contour of an an auto brake band and the eccentricity of a 36-in. propeller shaft. In some instances, such large and heavy parts are not even mounted on the comparator itself.

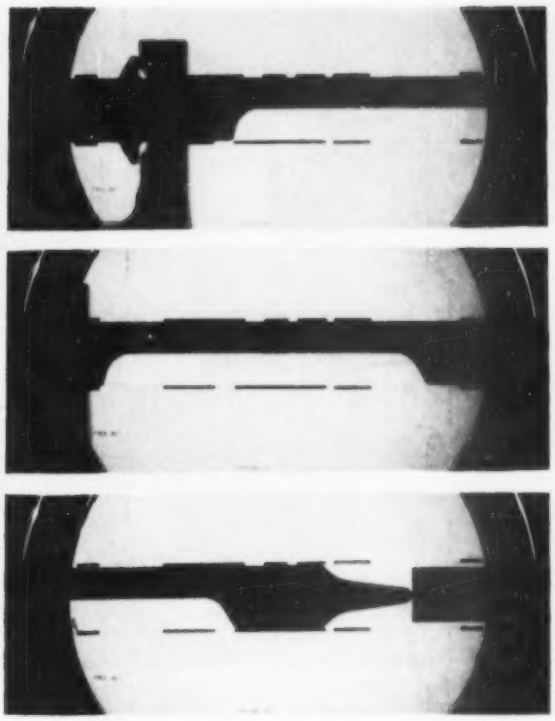
Staging fixtures usually go far beyond the simple function of supporting the part being inspected or adjusted. Where a part is even moderately large, or where the magnification is high, only a portion of the entire enlarged image will appear on the screen. This problem is solved by "multiple-position" staging fixtures. Similar to ordinary jigs and fixtures in that they are designed to fit the tables of various types of comparators, they permit the part to be moved in accurately measured separate steps. With such fixtures, it is by no means necessary to see the entire image on the screen at one time, and jobs can be handled, regardless of part size, at whatever magnification is demanded by the smallest tolerances to be determined. One chart can contain all the limit lines and tolerances associated with a number of fixture positions, therefore, mechanical gages conventionally required for a particular part are often reduced to one fixture and its chart.

Fixtures For Large Work

Another type of fixture developed particularly for inspecting large work is the "interposer" type. This staging fixture is fixed in position so the most important area of the part is presented on the screen. One end of an interposing bar or lever is in contact with some portion of the part outside the viewing area, while the other end of the bar extends into the field of view and is projected on the screen. Movement of the first bar between two points of the part outside the viewing area is faithfully matched by the corresponding movement of the second bar.



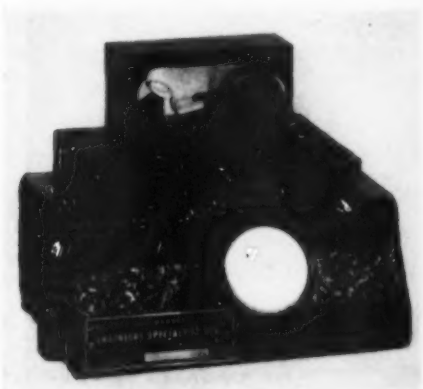
INDEXING FIXTURE eliminates need for table movement—has three indexing positions for moving long firing pin to be checked on "split" chart. Work, too long to be entirely visible on screen magnified at 10X, is rapidly indexed for matching with three sections superimposed on chart

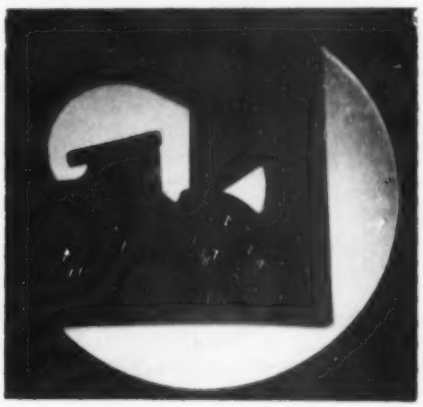


SPECIAL HEAVY LINES on chart for firing pin have indentations to provide "optical bridge" for quick reference. For acceptance, light must be visible in indentations whose depth is accurate and known. Oversize parts allow no light to be seen, undersize parts leave light under entire line

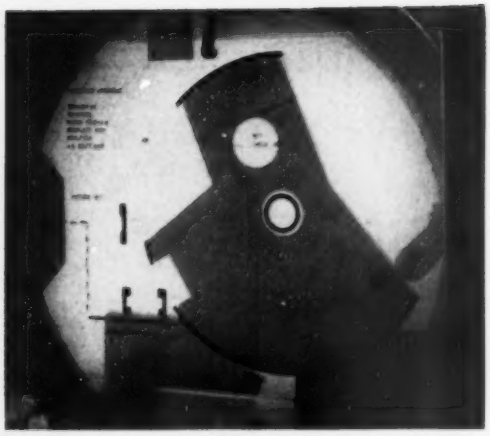
The position of the visible end of the interposer bar thus indicates a particular dimension on the part, even though this dimension is not projected on the screen. Charts used with such fixtures, have overlapping outlines of both ends of a large part and are known as "split" charts. Fixtures with several interposers are entirely practical, depending on the type of part being inspected.

One comparator manufacturer employs this principle for the inspection of turbine buckets on comparators specially developed for the purpose, (*AM* — Aug 4 '52). In this setup, styluses on tracing arms follow the contour of a bucket at any stage along its axis while another pair of styluses at the opposite end of the tracing arms move correspondingly before the projection lens. The projected image of the styluses before the lens follow the section outline on the screen if the form of the bucket section is correct. If the form is



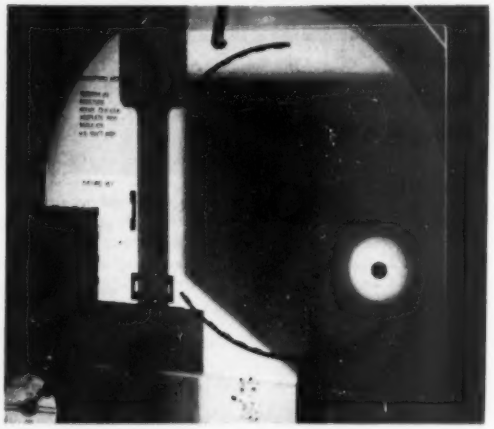


MORE THAN 500 STAMPINGS an hour are optically gaged in this staging fixture. Adapter in one position permits checking angle and radius of cam flats — 90° adjustment allows checking height



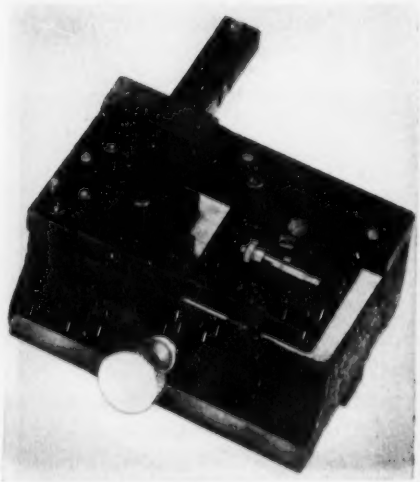
"OPTICAL BRIDGES" speed inspection of rotor-part contour. Light showing around black circle indicates correct location of hole. "No-go" pins along side of fixture provide quick double check of hole sizes when part is removed

THIS ROTOR PART for an artillery-shell booster required 100% inspection. Six dimensions are held to 0.0003-in. tolerance, 19 dimensions have a tolerance of 0.0002 in., 15 are held to 0.0001 in., and one has a tolerance of 0.0007 in. Optical inspection replaced 27 mechanical gages ◀

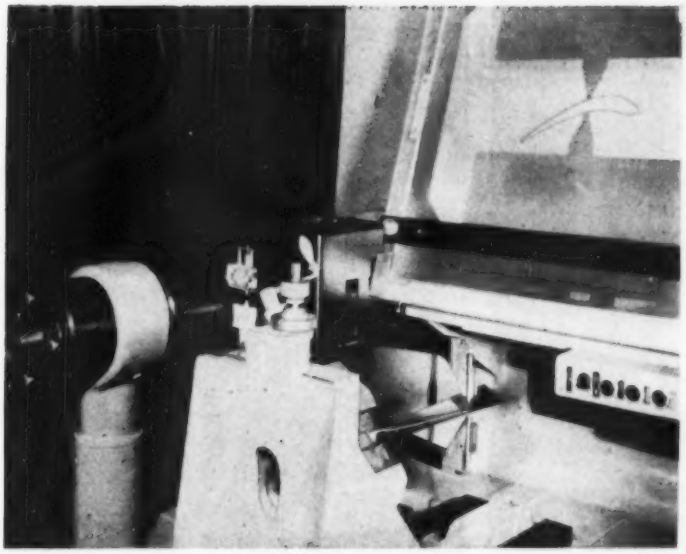


DISTANCE FROM CENTER of a hole to OD is measured with rotor part in this position in fixture—black circle surrounded by light. In addition, location of a hole relative to the face of the part is checked with interposed pin in the hole and in alignment with two bridge-type tolerance lines

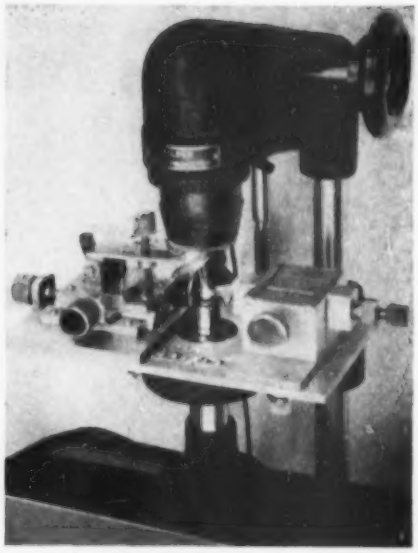
COMBINATION MULTIPLE POSITION and interposer fixture together with a special chart permits inspection of rotor part in 40 sec on optical comparator, as compared with 4 min. by conventional means. Part is moved to different positions in fixture for checking various dimensions and carbide-tipped interposer pins of "go" gage size check size and depth of blind holes, location of holes and thickness of part ▼



EIGHTEEN DIMENSIONS are checked in 15 seconds in this staging fixture for a pinion and its integral shaft. Part is moved to five positions in fixture, each of which permits checking at least two and as many as six dimensions. Third position of pinion and shaft in fixture allows optical inspection of two dias and shoulders. Middle dia is held to 0.00025 in. from axis which is easily read by special lines forming an "optical bridge" to provide a "go" and "no go" light scale



JET-ENGINE and steam-turbine buckets and blades are inspected optically at any stage along airfoil axis in this special setup. Styluses in contact with part are connected to tracer arms on which are another pair of styluses in front of projection lens. Movement of tracer styluses around part is followed by projected styluses on screen around scribed airfoil contour

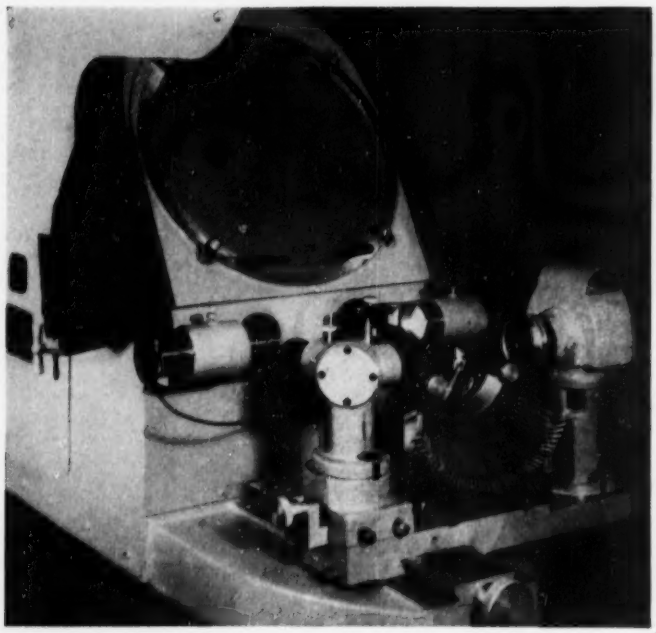


SAPPHIRE PHONOGRAPH NEEDLE tips are checked for accuracy of contour relative to record groove form in this setup. Piece of record is held endwise with needle tip engaged in groove for projecting mating of two on screen

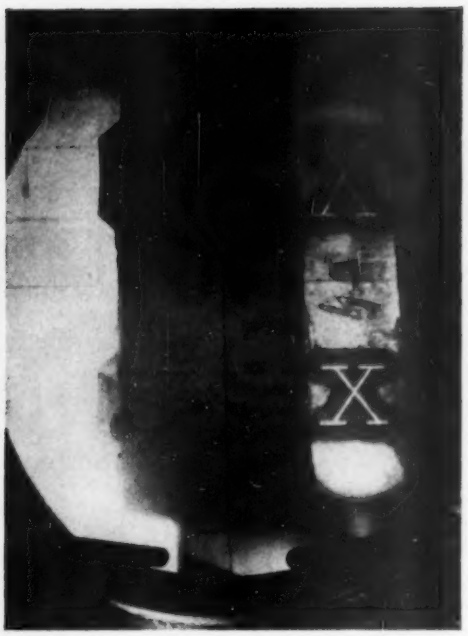
incorrect, the projected image departs from the section outline an amount equal to the error in the bucket section multiplied by the degree of magnification.

Another device sometimes employed for inspecting large, bulky parts or for checking internal contours is the reticle fixture. This has a reticle, (a small chart made to the actual size of the part being inspected) attached to one arm of a pantograph which allows complete freedom of motion in a given plane. The other arm of the pantograph has a tracing roller which follows the contour of the part being inspected in a parallel plane. The reticle moves in one-to-one relationship with the tracing roller so the projected reticle image floats over the screen area —always tangent to a reference circle on the screen as long as the part shows the proper contour. Deviations show up when the reticle image moves away from this circle and can be accurately measured at any given point. Reticles are produced to a high degree of accuracy by photographic reduction from machine-

ONE FIXTURE AND SIX CHARTS check 17 different parts for automatic transmissions on automobiles. Fixture is of the coordinating type that permits rapid inspection of different sections of various parts



TYPEWRITER TYPE SLUGS are inspected for related positions in this setup. Both surface illumination and direct projection are employed to show striking position and surface condition of characters

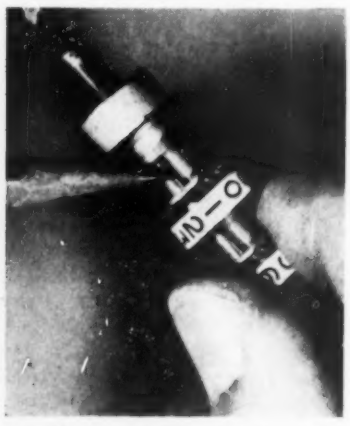


SPECIAL CHART has vertical tolerance lines to show longitudinal position of type characters—horizontal lines show vertical position. Both profile and surface of characters are checked at once

scribed masters and permit inspection of large parts at large magnifications.

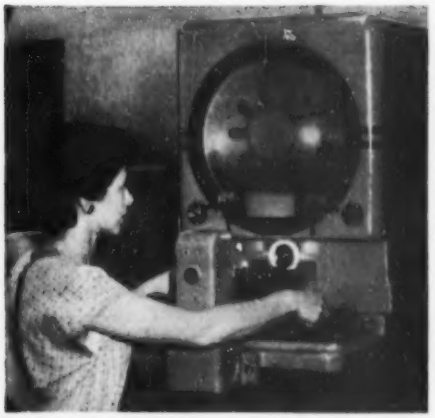
Simplest of all staging fixtures are holding devices for parts small enough so the entire image falls within the screen area. These are often "home-made" and may consist of simple V-blocks with various clamping means, square or rectangular blocks or merely flat plates. In general, two important considerations are taken into account in applying staging fixtures, in addition to the problem of holding parts to present an appropriate image on the screen. First, the part should be mounted in the staging fixture in as nearly as possible the manner in which it will be mounted in final assembly. Second, a means must be provided to bring the staging fixture into its proper position relative to the lines on the chart. This is usually done by reference, or "set" lines on the chart which are brought into coincidence with the image of reference or "set" lines built into the fixture. In the case of round parts, it is often convenient to use

PRODUCTION INSPECTION of calculating-machine parts is accomplished rapidly with simple staging fixtures. Parts with holes are held on locating plugs made to "go" gage sizes. "No-go" gages on machine table speed double checking



CALCULATING-MACHINE PARTS are made in high-volume production. Many parts on this carriage shaft are inspected optically as they are made

SPECIAL OPTICAL GAGING SETUP in screw-machine department of business-machine plant speeds checking first-piece runs. This provides quick check on correctness of machine setup and provides a means of controlling quality during production

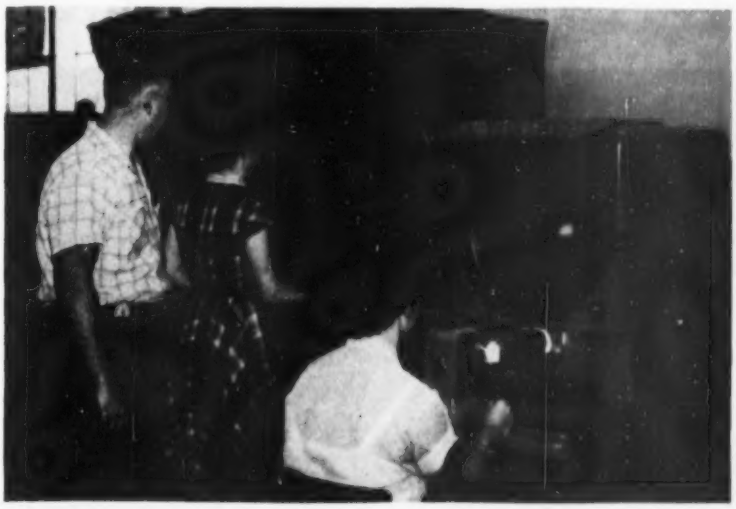


TOOL SHARPNESS AND LIFE are controlled in gear production for business machines by spot checking. First piece checking insures correct setups

a master plug or rod as a "set" surface. Sometimes a master part may be used.

Commercial staging fixtures are available in a wide range of standard types. Vise stages, for example, are made for staging small parts when no permanent setup is necessary. These can be set parallel or at right angles to table grooves, and special jaws can be used for irregular-shaped parts. Flat-work stages are made with graduated swivel bases for presenting work at any angle before projection lenses. Taper pipe-thread stages capable of holding pipe plugs, nipples, and fittings with dias from ⅛ to 1 in. are available, as are simple V-block stages for holding cylindrical parts on their OD's. Jewelers chucks are also made for staging small cylindrical parts and centers, and center blocks are available. Some of the latter are equipped with carbide tips and female centers.

Other standard fixtures include tool stages, right-angle stages, and fixture bases which can be machined to accommodate various types of holding devices. In addition, adjustable work stages that can be elevated vertically or moved horizontally, or both, are commercially available as are stages with leadscrews and micrometers for measuring horizontal movement.

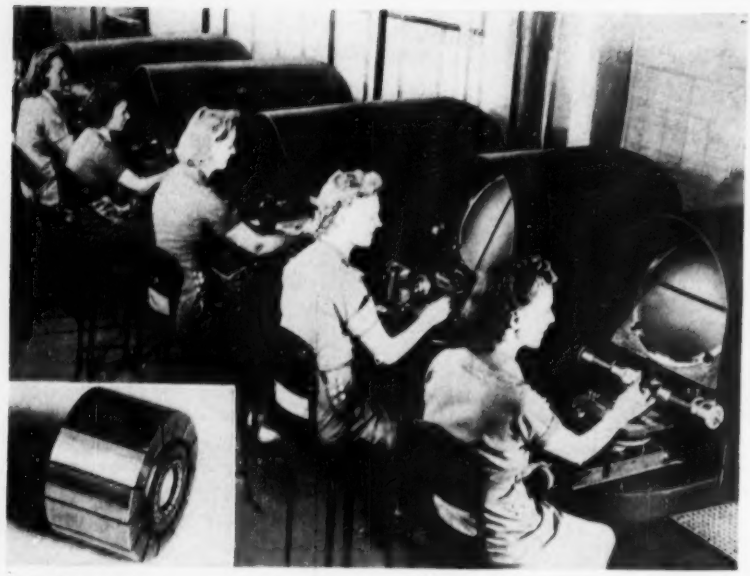


SUPERVISION OF INSPECTION, and discussions about questionable parts are easy with optical gaging because more than one person can see screens clearly

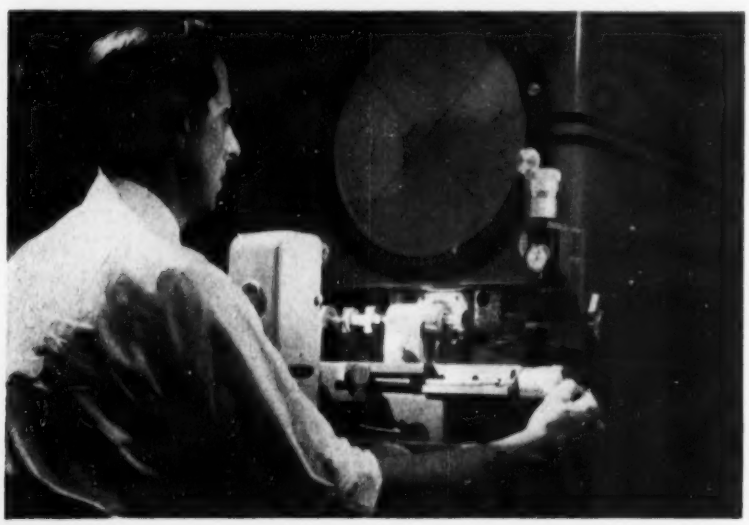
In-Process Inspection— High-Volume Production

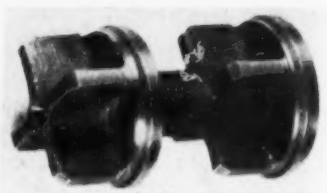
A business-machine manufacturer employs optical gaging for first-piece checks made on comparators located in screw-machine departments, press rooms, (where shaved blanks are similarly inspected) and in the gear-production department. In addition to proving accuracy of machine setups, this application of comparators provides a means of controlling sharpness and life of tools. Rejects resulting from worn tooling are nearly impossible because spot checks immediately show when parts are approaching limits. Throughout this plant, standard commercial staging fixtures are employed, slightly modified to suit particular needs. No complex, special fixtures are needed. Bored work, for example, is held on locating plugs that have body diameters made standard to fit all fixtures. Parts with shanks or shafts are held in locating plugs bored to suit, the OD's being made to fit all fixtures.

A typical application of these staging plugs with comparators



SUB-ASSEMBLIES are extensively inspected by optical gaging. Here armature segments are optically aligned before staking





CONTOUR OF DOUBLE-ACTING VALVE BODY is optically checked between centers in this fixture. For short-run work, table movements with micrometers and dial indicators measure axial dimensions instead of using special charts and fixtures

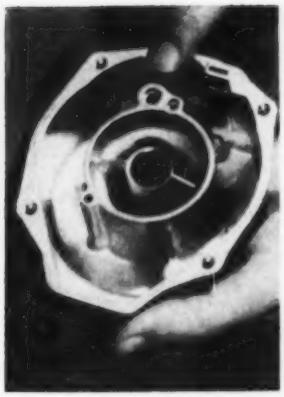
is in the inspection of counting-dial clearout cams for the carriages of calculating machines. In this part, four flanges and the body dia are checked, as well as the bore. The plug, made to "go" gage size, is mounted in a vise and a cam is slipped on the plug, thus checking the bore immediately, while over-all length, dias, dimensions between flanges, and flange thicknesses are inspected at a glance on a chart having tolerance lines. A "no go" pin gage at the operator's elbow provides a quick double check of the bore size when the piece is removed from the locating plug. A snap gage similarly placed permits fast double checking of a critical flange dimension. Normally a 50-piece check is given a run of 500 to 800 pieces. By eliminating micrometers, indicators and other mechanical gages, this setup has reduced inspection time from 45 to 11 minutes. With the same staging tools, five different screw machine parts are inspected in this setup by merely changing the charts. Identical bore sizes result from assembly of different parts on the same shaft in the calculator carriage.

Plunger pins 0.029 in. in dia have radiused ends tangent to a taper. These tiny parts are quickly inspected for radius size, angle of taper, plunger dia and over-all length by optical gaging at 50 to 1 magnification. Formerly this work was tediously done with gages and microscopes causing acute discomfort to inspector's eyes. Other business-machine parts optically inspected on a high-volume production basis include gear hubs for calculator multiplier dials. In these parts, occasional back tapers are quickly caught where conventional gaging would allow their acceptance. An accumulator-gear bearing, used in bookkeeping machines, has a bore eccentric with a flange and the main body dia concentric with two stepped sections. The chart employed for optically gaging this part shows the amount of throw provided by eccentricity of the bore when the part is rotated on a plug of the type described above. Body lengths, dias and flange width are also checked in the same setup.

Surface illumination is employed for checking the relationship of a cam surface with gear teeth on finished counting-dial clearout cams. This same facility is used for checking the relationship of printed numbers with gear teeth on dials for calculator carriages.

General Applications

Optical gaging is also extensively employed for selective as-



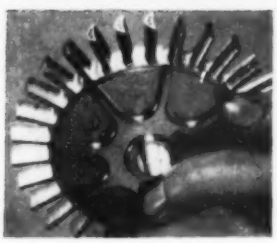
DEEP RECESSES in carburetor bodies are optically inspected for dimension and surface condition. Surface illumination method of optical gaging allows degree of inspection in recesses otherwise not possible. Simple clamping fixture holds carburetor body

sembly and for statistical quality control because it is possible to determine quickly and easily the exact dimensions of each part inspected. It is also widely employed in the canning industry for checking air-tight seams filled with a chemical compound that excludes air. In such applications, a cross-section is examined by surface illumination. Another important application is the checking of design and sizes of hydraulic packing where every angle and dimension is held to close tolerances. Here new molds are checked by optically gaging thin sections of sample moldings. In every application, however, main considerations are accuracy in the comparator, the chart and the staging fixture.

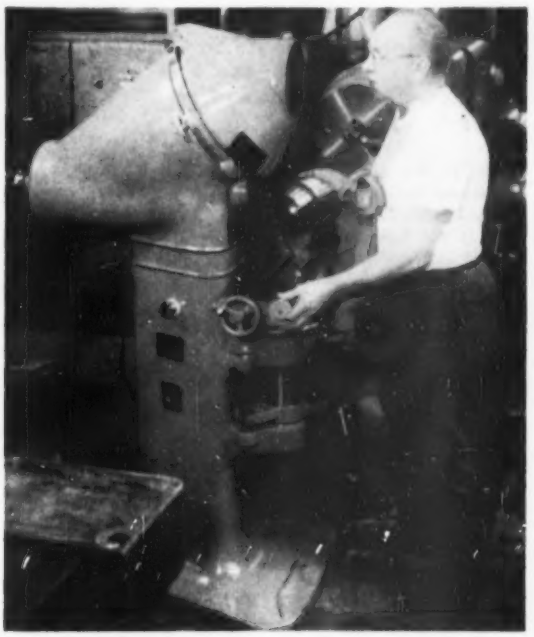
Short Runs, Small Parts

In the manufacture of precision instruments, tiny parts such as pivots, jewel screws and bearings, springs, and gears, must be held to close tolerances. Many of these parts, almost microscopic in size, are difficult to clamp mechanically. Usually they have odd-shaped contours or critical dimensions that can be checked quickly and accurately only with optical comparators. In at least one instrument plant, these machines are located in proximity to screw-machine operations, jewel-bearing laboratories, spring-winding departments, or other places where parts require inspection as they are made.

Fixtures and charts are simple



END PROFILES AND SURFACES of jet-engine impeller blades are rapidly and accurately inspected with surface illumination and a toolmakers V-block

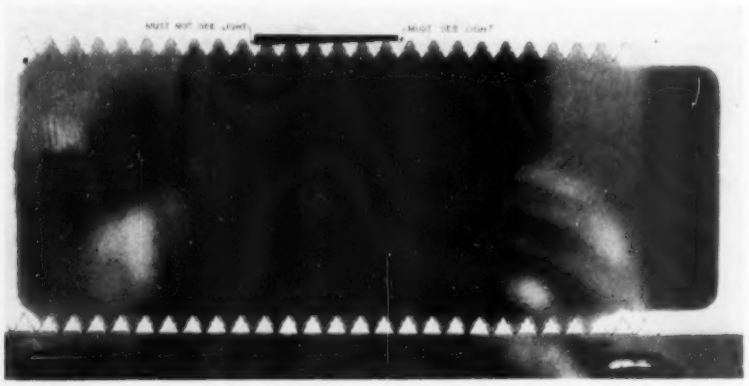


SPECIAL THREADS are checked optically to speed production of tool joints used on ends of drill pipe. Tool joints make connection between each two lengths of pipe in a string for rotary-drilling oil and gas wells

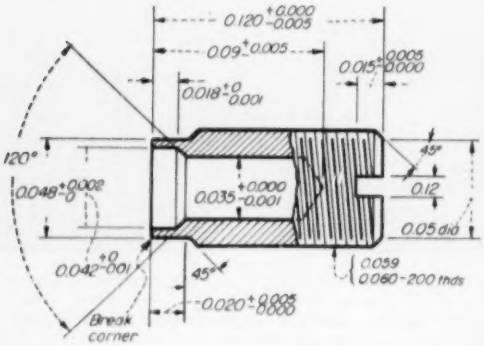
ALL DIMENSIONS ARE SEEN AT ONE TIME in checking precision pinion blanks as they are made in screw machines. Pinions are held on "go" size plug clamped in a small vise. Knowing whether pinions are being made on top or bottom limits permits close quality control. High degree of accuracy is required because pinions are part of a precision gear train in an electrical instrument

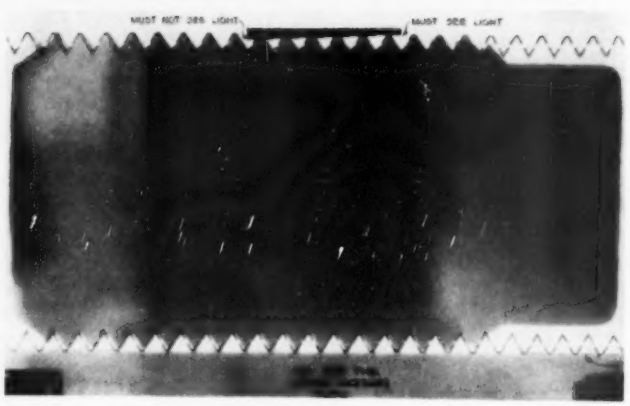
because production runs are relatively short and not often repeated. Temporary charts are quickly made up of such stable materials as glass-fiber tracing cloth or vinyl sheet, using drafting instruments and a magnifying glass. Glass-fiber charts are filed in loose-leaf notebooks according to drawing number for quick reference. Semi-permanent charts are made by photographing master drawings carefully prepared on plastic sheets. A reference line, usually 5 in. long, is drawn on the master to enable the photographer to check the accuracy of his reproduction. Masters are made in one day to avoid possible changes overnight resulting from shrinkage or expansion of the material on which they are drawn. Permanent charts for the most accurate work are purchased.

Simple staging fixtures have been developed from small blocks held in vises. Straps on these blocks bridge the top surfaces



JEWEL SCREWS for instruments are checked for thread form and pitch—nearly perfect screw at top is 0.060 in. in dia with 200 tpi. Thread form on same-size screw at bottom is bad. Screws are held in small staging block with lantern-slide glass panels that permit light passage from lamp to lens





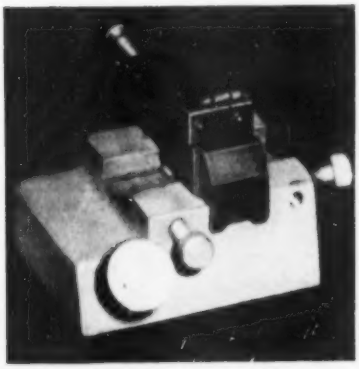
INSTRUMENT POINTERS are checked for correct curve of bend and are rebent as necessary in accordance with chart having limit lines curving upward from horizontal reference line. Pointers are used on instruments with spherical faces so that exact radii are required. Simple fixture with an extending stud holds pointer on pivoting bore

PRODUCTION INSPECTION of internal radii in jewel bearings for instruments is accomplished optically by inserting lead plug in jewels to form a matching male radius that is compared with a simple chart. Radii run from 0.003 to 0.006 in. are quickly and easily inspected on table model comparator

and have tapped holes to suit small instrument screws. By inserting a screw in a strap, its thread form is easily checked on the comparator screen together with such dimensions as length of thread, over-all length, screwhead dimensions and others. Another application of these small blocks as staging fixtures is for cylindrical pieces that can be seen through parallel glass plates, (lantern slide glass) fastened on each side of a male V. Image of a cylinder, held in the V by the glass, is projected to the comparator screen without interference. Standard fixture bases have milled slots to suit these small blocks.

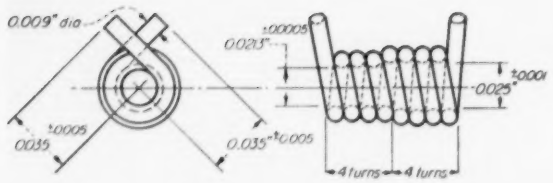
A special universal fixture holds a wide range of parts. This has a standard staging base on which is mounted a sliding block. A special clamping arm is fastened to the block which also has V-shaped work-holding jaws made of Brown & Sharpe flat ground stock. With this tool, work of nearly any size or shape can be quickly set up in a comparator by changing the work-holding jaws around, or by moving the block.

Pivots for holding moving parts of instruments between jewel bearings require close inspection. Most critical dimensions are end radii which are held to tolerances between 0.0005 to 0.0008 in., 0.0008 to 0.0012 in., etc, depending upon size. As pivots are made, sample lots are checked in a simple fixture with a base keyed to the machine table and a clamping bar in which small V's have been ground vertically. The chart has several scribed circles corresponding in

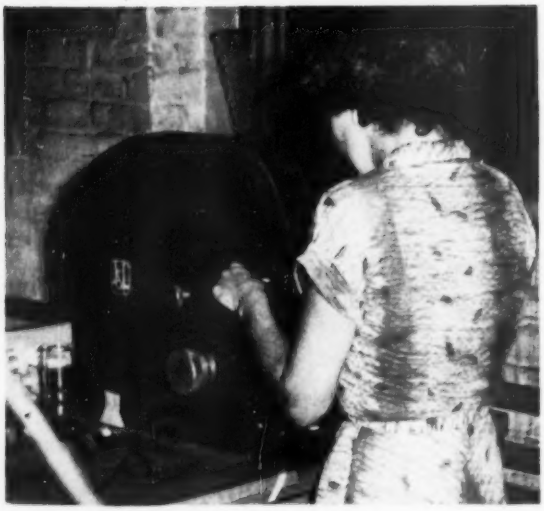


SIMPLE FIXTURE for measuring tiny, cylindrical instrument parts consists of two parallel pieces of lantern slide glass, one on each side of a male V-block in the fixture. Glass permits light to intercept work for clear image on screen

NEARLY TOO SMALL TO HOLD, these parts are typical of instrument components easily inspected with optical comparators

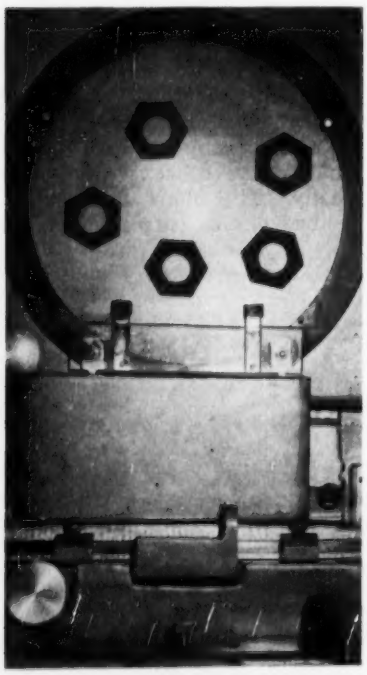


NEARLY MICROSCOPIC instrument springs are optically inspected for length of "tails"—that is, distance of end turns from axis center. Springs are used as spiral balance weight in instrument and are checked as they are made. Springs are rotated on a pin that is secured in a simple staging fixture to bring tails up to maximum height—projected image is measured on graph chart on which each square equals 0.001 in.



radius to the required pivot radius multiplied by the magnification used. A number of pivots of a given size are quickly loaded in the fixture and successively aligned with a circle as the table is traversed.

It is common practice in many places to make impressions with sulfur and graphite, dental alloys and other soft materials for accurate inspection of internal contours. An internal-radius-measuring setup in one instrument plant, is permanent and is employed solely for checking jewel-bearing radii. A soft lead plug is inserted in the jewel, thus forming a male radius on the plug which is easily compared with a charted radius on a comparator screen. Radii range in size from 0.003 to 0.006 in. depending upon the size of the bearing. In checking instrument gear tooth fillets, hand made charts of radii as small as 0.002 in. are used. Small bench-type comparators are set up in close proximity to gear-hobbing machines to speed this operation. Deviations are quickly noted and tools adjusted accordingly.

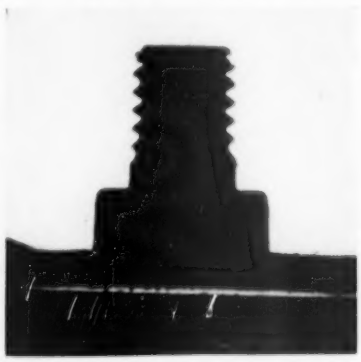


TINY INSTRUMENT NUTS, too small to hold, are quickly and accurately checked for concentricity by placing them on a special ground glass fixture table and employing a vertical beam of light for projection to screen

Photographs of comparator screens are useful to illustrate the exact nature of errors when work is made by sources outside the plant. In some cases, description and explanations amount to long reports, while a single photograph will tell the story at a glance.

A vertical illumination unit on one make of comparator eliminates special holding fixtures for very small work. In instrument work, this is especially convenient where parts are too small to handle or cannot be clamped for accurate measurement with any degree of speed. A table fixture with a transparent glass surface is placed on the machine table and small parts are placed on the glass top. A beam from a lamp over the table intercepts the work and enters a special 45° angle mirror which is attached to the horizontal lens. The result is an image of the parts on the screen, enlarged for easy checking of profiles, direct measurement, or visual sorting. Microscopic gears are checked in this way for tooth form, concentricity and size. Small cams, levers, latches, springs and coils are among the many other parts accurately checked for shape and dimensions in this manner.

Sub-assemblies are also extremely important to the success-



THREAD CONTOURS on instrument pivot bases are small—0.030 by 200 tpi—like nuts used with them, they cannot easily be checked by methods other than optical projection

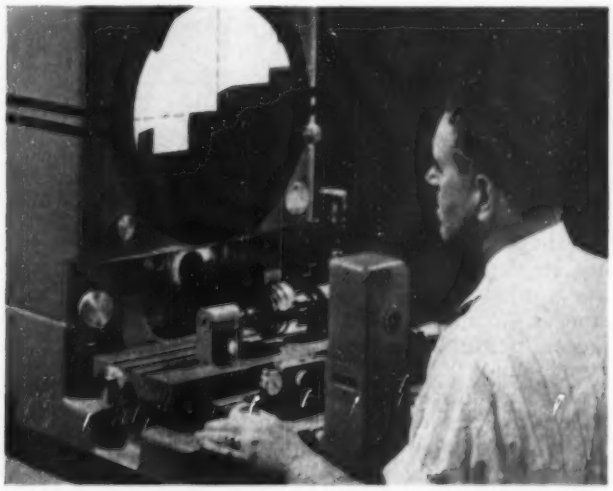
SPECIAL CUTTING TOOLS are made in production quantities aided by optical gaging. Precision grinding within 0.0001" to 0.0002-in. tolerances is speeded by comparators at each machine

ful operation of instruments. Many are inspected on optical comparators to avoid trouble later in expensive major assemblies. Gear trains, for example, are checked in one instrument plant for axial location, mesh of the teeth, and interferences. Surface illumination is extensively employed for this work.

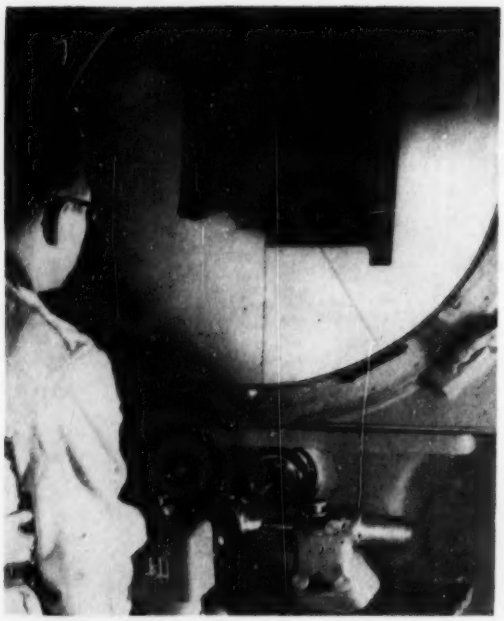
Special bevel gears are typical of the parts inspected on optical comparators with surface illumination. Over-all lengths of the gears are checked, as is the way they match, and the edges of crowns and their degree of mesh. The measurement of base to apex on the pitch dia is held in some cases to ± 0.0005 in. Surface illumination not only permits rapid and easy measurement of these elements but also shows up minute particles of dirt which cannot be tolerated in instrument assemblies.

In the case of one instrument gear, a particular tooth had to be exactly in line with the gear center. Before optical gaging was used to establish this relationship, it took four hours to set up one gear and locate the center of

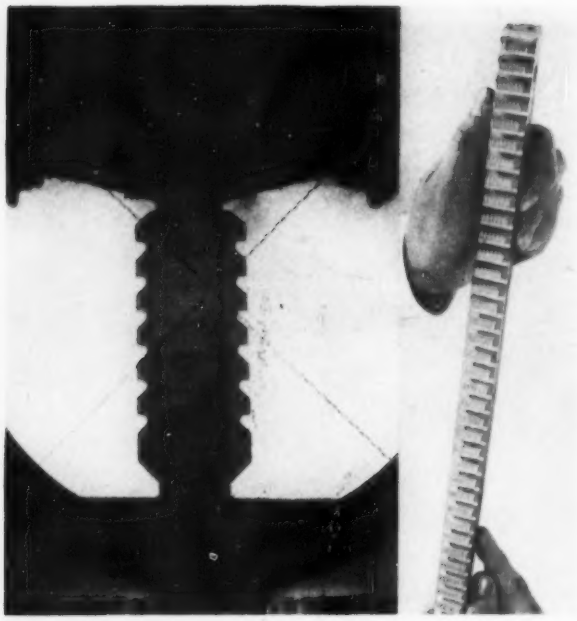
1- OR 2-PIECE PRODUCTION of precise, special-purpose cutting tools requires constant checking. Here, a tool nearing completion is compared with a simple chart



CIRCULAR FORM TOOLS of any degree of complexity can be optically checked quickly and accurately with simple staging fixtures



SAVED $3.00 to $5.00 AN HOUR in one shop where form tools are checked on a comparator



SURFACE ILLUMINATION combined with direct projection permits simultaneous inspection of front, top land and back of this broach

the tooth form by indexing from the center of the gear. With the comparator and surface illumination, a few minutes are ample. A gear is placed on the glass surface of a standard table fixture with an index point on the gear placed downward for projection on the screen. The gear bore is aligned with a matching circle on a chart. The tooth center, indicated by the index point, is aligned by rotating the gear to bring the index point into alignment with the bore centerline on the chart. A protractor ring could be used for this inspection, or the machine table could be rotated.

It is interesting to note that where short runs are common, the simplest fixtures and charts are employed—in fact, no tools are needed at all in many instances. Comparator-table movements permit direct measurement, and commercial glass scales are also available. Vises, clamps and stages are kept simple and flexible so tooling is cheap and readily adaptable to different kinds of short-run jobs.

OVER 10,000 PEN NIBS A WEEK are optically inspected for size and contour of ink slits. Parts were formerly inspected with magnifying glasses — with less speed and accuracy arising from operator fatigue

We acknowledge . . .

. . . the generous assistance given in the preparation of this report by:

Jones & Lamson Machine Co—Springfield Vt
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Monroe Calculating Machine Co—Orange NJ
The National Supply Co—Toledo, Ohio
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R S Wilder, Inc—Waltham, Mass
George Scherr Co, Inc—New York, NY
Bausch & Lomb Optical Co—Rochester, NY
American Optical Co—Buffalo, NY

ROUND TABLE

Bait for Speed

"That scheme of yours of getting Number 10 back in service may work now, Ed, but I'll bet you regret it before you're through."

"You mean it's bad to offer the boys a turkey dinner if they get it back in running condition before a certain time? Shucks, it's no different than the old days when the offer would be a keg of beer."

"No, it isn't, at that. But the keg of beer didn't work too well in the long run either—that's why the custom didn't last. Oh, you may get Number 10 in running order on time all right, but what are you doing to the fellows? Aren't you sticking your neck way out? It seems to me, Ed, they'll be expecting a treat for taking care of any emergency in the future."

"Oh no, Al; I don't think so. Number 10 being down is a real bottleneck in the whole production setup, and I have to do something unusual to get the boys to realize that it's really critical. We've got to get it running at the earliest possible moment."

"You may be getting this one running as you expect but what about the next time? Will you have to hold a carrot out in front of them like the fellow did to his jackass in order to get him on the move?"

"You mean to say that if I don't tempt them with a banquet the next time, they will lay down on the job?"

"Put yourself in their place. Once they get a taste of candy they'll always expect some more. From my viewpoint, I think you've made a mistake in not letting the job go through in the regular way—give them orders to get the machine in commission by a certain time and insist they do!"

"That all sounds very nice, Al, but it means money to the company to have that machine functioning pretty soon, and the little it's going to cost to set the boys up isn't anything in comparison to tying up the whole works."

"But the principle is what's wrong, Ed. They're not kids; they're grown men who can understand the problem if it's presented right. If they can't pitch in without something extra-special, the morale in your department is pretty low. I think you're taking a step backwards toward paternalism."

"And I think, Al, that you're full of the sweetness-and-light routine again. Be practical!"

***IS THE SPECIAL AWARD** for the rush job outdated? Does it get results, or set a bad precedent? Is it necessary or just paternalistic? Your ideas and opinions on this subject will interest others. Discussions of earlier topics appear on later pages.*

what about your alcoholic employee?

More than one billion dollars per year is the estimated loss to industry from alcoholism.

Much of this loss, and related human suffering, can be avoided.

What you and your company can do is given here.

Suggestions are based on the experience of Alcoholics Anonymous* with more than 100,000 problem drinkers

"We don't have any problem with alcoholics. We fire them!" Fortunately, this attitude is being uprooted in many organizations. Today, management on an increasingly broader scale realizes that the alcoholic employee is a sick person who, if he has an honest desire to do so, can arrest his illness and become a useful productive worker once more.

In a number of plants, alcoholism is recognized as a disease and help is offered to problem drinkers as a regular part of the company health program. At DuPont, for example, employees who have an uncontrollable problem in alcohol are urged to see the company physician. He tells them about Alcoholics Anonymous, and the medical staff at Wilmington includes a member of AA who works directly with problem drinkers. About 65% of the men and women who come for assistance are rehabilitated. Eastman Kodak is another company with an outstanding program of recovery. In this case, the company cooperates not only with AA but also with an excellent community program in the city of Rochester.

can a supervisor help?

Over and beyond formal company programs, there is a great deal that the individual employer or supervisor can do. By understanding the problem with which his employee is faced, by knowing how to discuss it with him, and how to handle him during recovery, the supervisor can play an essential role in helping a valued member of the company regain his perspective and resume his place in the organization.

That it pays to help alcoholics is indicated by the fact that absenteeism among known alcoholics is estimated to average 22 days per year. Add to this the cost of spoiled work and damaged tools plus the cost of interrupted production schedules and the need for filling in for the alcoholic with someone of less skill or experience, and the total cost of alcoholism to industry reaches the staggering figure of well over a billion dollars per year. Disregarding human values and the richly rewarding experience of helping a fellow man, it therefore is well worthwhile from a purely economic standpoint for supervisors and employers to know how to deal intelligently with the problem of alcoholism.

what is alcoholism?

Alcoholism has been described as a physical allergy coupled with a mental obsession. What this means, briefly, is that the alcoholic has lost his tolerance for alcohol, he can no longer handle it rationally. At the same time, he has a compelling desire for liquor.

While society is just beginning to understand the nature of this disease and how to cope with it, there is fairly general agreement on a number of basic facts:

1. There is a distinction between the heavy drinker and the alcoholic. While the former may overindulge on occasions, he does not let alcohol disturb the pattern of his living.

2. "Once an alcoholic, always an alcoholic." Once a person crosses the invisible borderline between social drinking and compulsive drinking, he never is able to drink normally again. A single drink may be enough to start the alcoholic on his merry-go-round. Alcoholism may be arrested, but it never can be cured.

3. The only way for an alcoholic to cope successfully with his problem is to abstain completely from even the smallest quantity of alcohol in any form.

what can you do about it?

Most alcoholic employees can be helped to achieve and maintain sobriety. The only significant requirement is an honest desire to stop drinking.

Let's assume that one of your employees who turns in a good day's work when he is sober and "on the ball" has obvious alcoholic tendencies. You plan to talk over his problem with him and to suggest he contact AA. How are you going to approach him? What are you going to tell him?

First, if you hope to get maximum results from the interview, you will keep one basic thought in mind—that your attitudes toward alcohol deserve no place in the interview. Thinking of his condition as basically an illness, you then can give him the story of AA.

what is Alcoholics Anonymous?

Alcoholics Anonymous is an informal society of more than 100,000 men and women throughout the world who once drank irresponsibly but who now stay sober by helping others to achieve and maintain sobriety.

There now are more than 4000 local AA groups that hold regular meetings to which anyone with a drinking problem is invited. Many groups also hold "closed" meetings limited to alcoholics themselves.

AA is financially self-supporting. There are no fees or dues and the size of members' contributions is limited. A headquarters service office in New York handles inquiries and requests for literature.

how does AA work?

The newcomer to AA is urged to attend as many group meetings as possible. There he will hear AA speakers tell of their experience and also will hear references to the "Twelve Steps of Recovery."

At first he may be somewhat disturbed by the spiritual note of the AA program. He then will learn that, while most members agree that belief in a Power

*Adapted from the booklet "The Alcoholic Employee," published by The Alcoholic Foundation, P O Box 459, Grand Central Annex, New York 17, N Y

greater than themselves is essential if they are to rid themselves of the control alcohol has over them, Alcoholics Anonymous is not a religious movement in the denominational sense. As the newcomer develops confidence in his own sobriety, he will be asked to work with other alcoholics who still need help.

Early in his association with AA, your employee will learn that Alcoholics Anonymous exists only to help the person who has a drinking problem. Affiliation with AA will not automatically clear up the financial, marital, or job problems that may have been harassing him. Once he becomes sober, however, the alcoholic usually can face up to his minor problems realistically for the first time in his life.

what is the supervisor's role?

Even though your employee has turned to AA, you may still face a few problems in trying to help him. He may be in poor physical condition, needing medical care, hospitalization, and rest. Only a doctor can determine these needs. If you are willing to advance the cost of such treatment, it is wise to have it understood that it will be deducted from his pay later on.

When a newly sober alcoholic returns to work, many employers make it a practice to have a friendly talk with him, emphasizing that his past drinking will not be held against him. At the same time, the understanding employer or supervisor will remind his employee directly that an alcoholic cannot risk taking even a single glass of beer. He will point out that experience demonstrates the importance of staying close to his local AA group, attending meetings and working with other alcoholics, and practicing the AA program in his daily living.

how do alcoholics react?

At this stage your employee faces a number of challenges. First, he wants to stay sober by staying away from "the first drink". Next, he wants to make good with his family and with you, his boss. Finally, he wants to pay his debts and make amends to those he has harmed.

In other words, he is trying to make up for a lot of lost time. He may be inclined to overdo things, to become tired and jittery, and to become discouraged when he notices that sobriety, instead of making his problems disappear, only shows them up more clearly. In spite of his sincerity, he may have difficulty staying sober. Not all alcoholics respond in the same way.

This is the time when the employer and associates of a sober (but still alcoholic) employee can be most helpful. A word of encouragement can work wonders. At the same time, he does not have to be babied. Occasionally, he may ask time off to work with other alcoholics. This gives him a sense of stability.

Not all alcoholics "get" the AA program the first time they're exposed to it. (Some, of course, never do.) Your employee may stay sober for a while, then have a relapse. If this occurs more than once, you'll have to decide whether to keep him on the payroll. If he is not honestly trying he may still need that unfortunate shock treatment known as "being fired."

what results can be expected?

Both in companies with facilities for a systematic approach to the problem of alcoholism and in those in which an individual employer or supervisor attempts to work with one or two alcoholic employees, the chances of restoring the problem drinker to productive living are good. In these attempts, experience shows that Alcoholics Anonymous can be one of the most effective tools available to management. Success can be anticipated in substantially more than half the cases.

what leading companies are doing...

CONSOLIDATED EDISON of New York has formally recognized alcoholism as a health problem. In certain cases, disability retirement benefits are paid to employees who are forced to discontinue working as a result of chronic alcoholism. Every effort is made to rehabilitate the victim and restore him to full working capacity. The longer his service, the greater the time expended on his recovery.

EASTMAN KODAK COMPANY has helped in the development of a community program for education on alcoholism. This aims to make available in industry and in the community all the effective knowledge and techniques that have been developed for the care of the alcoholic. This has been a cooperative enterprise involving medicine, psychiatry, social agencies, law enforcement agencies, and AA.

Dr John L Norris, Medical Director says: "Hospitalization, medication, and the understanding physician, by themselves alone, have been so ineffective in the past that most physicians accept the responsibility for care of an alcoholic with reluctance. However, these, plus AA, can be more than 50% effective."

how does one become an alcoholic?

Most alcoholics can not tell you why, how, or when they "crossed the line" and became irresponsible drinkers. In any large company, however, a variety of backgrounds leading to uncontrolled drinking probably can be found. To illustrate,

George S—*is an executive. He had great ambitions to make a mark for himself in the company. Unfortunately, he seemed to have an inferiority complex which he tried to hide through drinking. Starting with only two drinks "to brace himself," he soon began to overindulge. He faced loss of his job until his superior and doctor succeeded in interesting him in AA.*

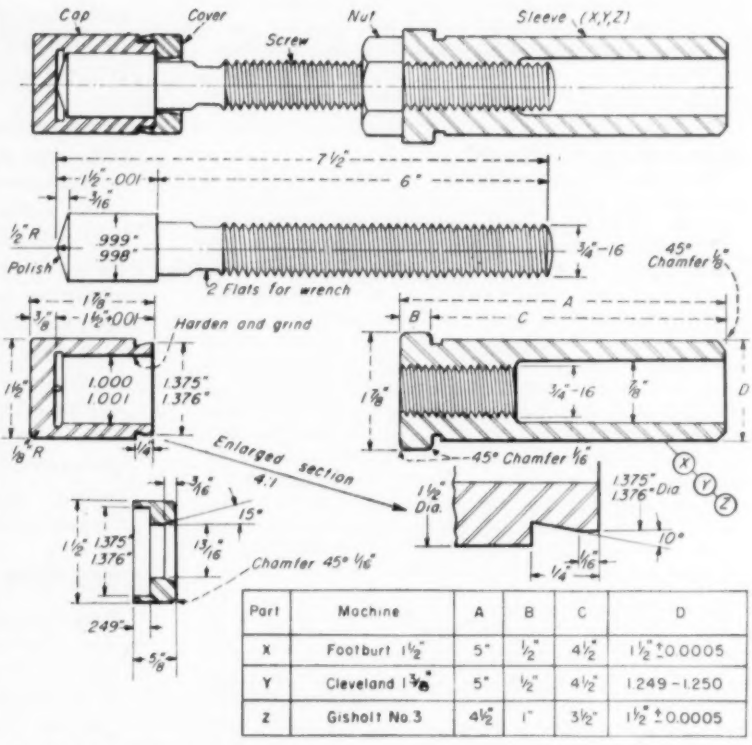
Jim D—*is a millwright. His wife was a victim of cancer. Jim became increasingly unnerved by her suffering and started drinking at home after visiting her in the hospital. He began to drink more heavily and soon found he needed a morning drink to keep going. When his wife died, after many weeks in the hospital, he found he had no resistance to alcohol. Instead, he felt a strong craving for liquor. An alert supervisor and an understanding plant physician directed Jim to AA.*

how to get in touch with AA...

- **Through a friend or acquaintance.**
- **Through local AA groups. These are listed in your phone directory.**
- **By writing The Alcoholic Foundation, P O Box 459, Grand Central Annex, New York 17, N Y**

Practical Ideas

Revolving Bar-Stop for Turret Lathes



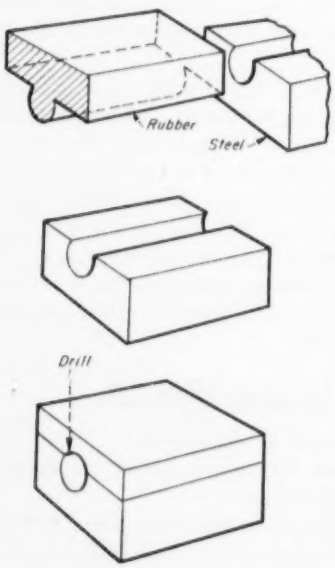
Part	Machine	A	B	C	D
X	Footburt 1½"	5"	½"	4½"	1½" ±0.0005
Y	Cleveland 1¾"	5"	½"	4½"	1.249 - 1.250
Z	Gisholt No.3	4½"	1"	3½"	1½" ±0.0005

To improve production by reducing the amount of set up time usually required on turret lathes, we developed the revolving stop shown. This device is unique in two ways:

1. It is readily adaptable in that only the sleeve must be custom made to fit the particular lathe on which it will be used. All of the other parts can be made in quantity, for use on any lathe.

2. Versatility is further provided as the bar length can be adjusted in the bar-stop without touching the stops for turret travel.

Construction of the stop is not complicated. The cap runs freely over the screw head and is locked by rolling or knurling the rim of the cover into the groove. The screw is adjustable in length; is screwed back and forth in the sleeve and fastened in the proper position with the locknut. Two flats are provided on opposite sides of the screw, to simplify adjustment with an open-end wrench. A ⅛-in. dia oil-hole is drilled into the forward part of the hole provided in the cap for the screwhead. Spindle oil should be used, but moderately. *Erik K Henriksen, Cornell University, Ithaca, N Y*

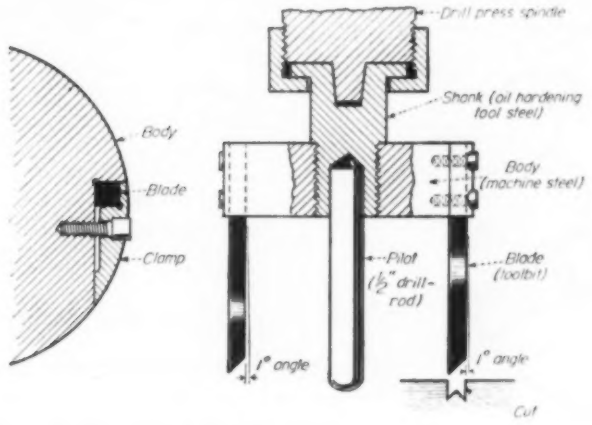


How To Anchor Rubber to Steel

Fixturing and presswork frequently require tough rubber pads attached to steel blocks. This may be necessary on clamps to prevent the steel from marring or denting the workpiece; it may also be used for forming in press tools. It is possible to cement the rubber to the steel, but this is seldom satisfactory. Another more efficient, but also more costly way, is to dovetail the rubber into the steel.

A third method works as well as dovetailing, but is much simpler. Two pieces of steel, slightly larger than the steel block required, are clamped together and a hole is drilled as shown, so that the clamped surfaces form a chord intersecting about 1/5 of the drilled hole. Then the blocks are separated. The rubber pad is bandsawed to correspond to the shape of the partial hole, but slightly oversize. (Rubber will saw easily if kept wet.) Finally, the rubber pad is compressed and forced into the hole in the block. Cement can be used to improve the grip.

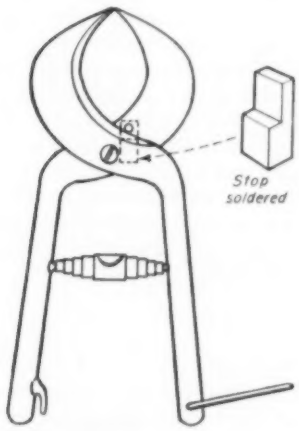
A rubber pad, locked in a steel pad, makes an excellent form tool for short run drawing jobs. The rubber should be tough and semi-hard. A female die is either machined from steel or cast from low-melting-point alloy and camped on the table of an arbor press, beneath the ram containing the rubber pad, which forces the sheet into the die. *G W Richards, Allentown, Pa.*



Flycutter Bores Clean Hole in Wood or Plastic

The Woodworking Department foreman pranced into the toolroom spouting fire and demanding *something* to cut a perfectly round 3¾-in. dia hole through 2 in. of black walnut. The bore had to be exactly 90° to the face. Several quick trials produced about $60 worth of smashed and bent hole-saws and hole-cutters but no passable holes. The only machine available for the job was a light ½-in. capacity drillpress, so I made the boring tool shown for this machine. By drilling a ½-in. pilot hole in the blocks and then using this tool, perfect holes were accomplished.

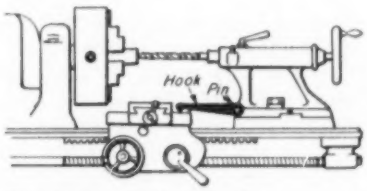
This borer consists of a steel cutter block which is threaded to a shank for attachment to a drillpress spindle. The opposite end of the shank is drilled and reamed to press-fit a ½-in. dia drill rod pilot. Clamped on opposite sides of the cutter block are two ¼-in. sq HSS toolbits, positioned so that one cuts on the outside of the circle while the other is cutting on the inside. Two socket-head capscrews hold each clamp against each toolbit. Each cutter has a 1° clearance angle between its cutting-edge and the workface. Actually, this tool is a form of flycutter. Wood is cut dry, while kerosene is used for plastic or resin. *Donald W Hoffman, (no address given)*



Pruning Shear Makes Rivet Cutter

To produce 1/16-in. dia soft rivets for countersunk holes, take a length of 16 gage copper-coated welding rod and coil it to about 3-in. dia. Heat this coil to cherry-red for about 10 min. This will soften it and scale the outside, thus remove several thousandths from the diameter when it is cooled.

Drill a 1/16-in. dia hole in one blade of a pair of pruning shears, just behind the cutting angle and close to the pivot pin. Soft-solder a small stop on the opposite side of the blade, feed the wire through the hole and cut the rivets to size and burr-free. For large quantities of rivets, one handle of the shear can be bolted to the table and the other handle fastened to an air cylinder or solenoid operated by a push-button. *H F Spinks, Belfast, N Ireland*

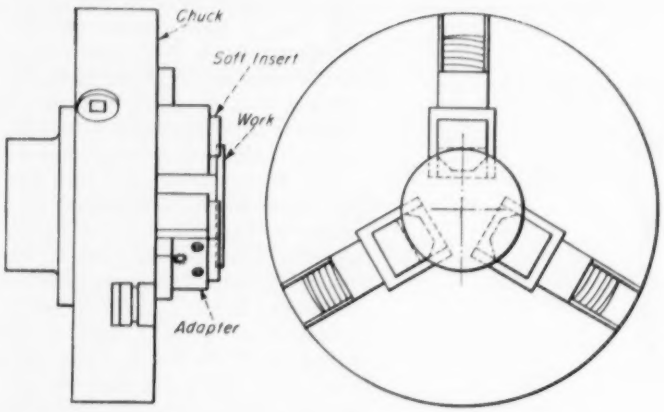


Carriage Feed Speeds Production Drilling

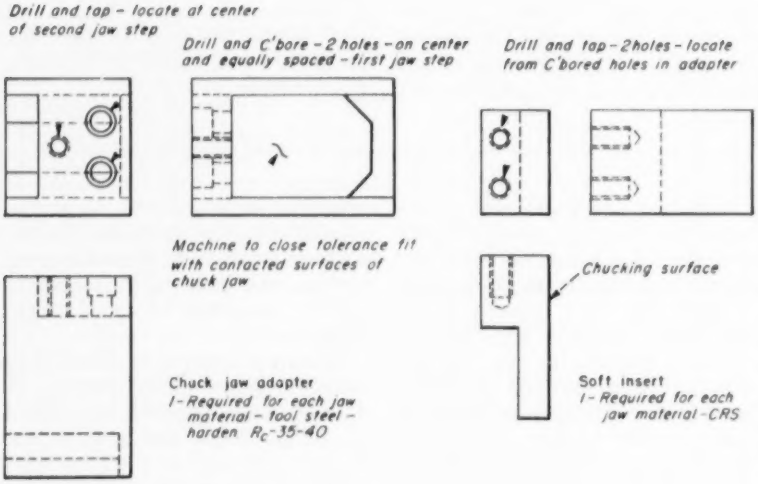
Large quantities of parts are often drilled on a standard lathe when they could be done on a screw-machine or a turret lathe, if these machines were available, at a considerable saving. If drilling is required, particularly large diameter drilling or deep holes, the operation can be simplified by using a carriage feed.

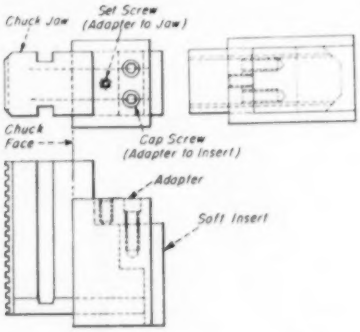
A plate is screwed to the carriage which engages a pawl that is attached to the tailstock by a pivot or hinge. When the pawl is engaged, the carriage tows the tailstock to advance the drill into the work. Feed is determined by the carriage to suit the particular job. The nut which clamps the tailstock to the ways should be finger-tight to permit free movement without slop and the ways should be well oiled to prevent wear and reduce drag. *Gordon W Richards, Allentown, Pa.*

By using this idea together with the idea "Drill Without Centering" described on p 148, a very fast and simple drilling setup is obtained. Use of a quick-loading fixture on the lathe spindle, or in the chuck, makes this a good production setup.—*Ed.*



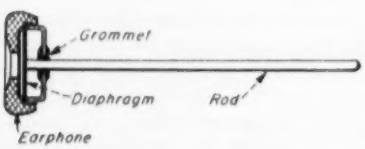
Adapters Simplify Soft-Jaw Application


Drill and tap – locate at center of second jaw step
Drill and C'bore – 2 holes – on center and equally spaced – first jaw step
Drill and tap – 2 holes – locate from C'bored holes in adapter
Machine to close tolerance fit with contacted surfaces of chuck jaw
Chucking surface
Chuck jaw adapter
1 – Required for each jaw
material – tool steel –
harden R_C 35-40
Soft insert
1 – Required for each
jaw material – CRS



Soft-jaws provide a very practical and accurate means for chucking many different parts, but the time and expense of frequently changing jaws and keeping a supply of jaws on hand limits their acceptance. All chuck manufacturers supply unhardened jaws for their respective chucks, and they should be more widely used, but they are not. To overcome this objection, I designed the adapter shown for use on conventional chuck jaws.

These adapters, one for each jaw, are made in two parts: The chuck jaw piece, which is permanent, and the soft insert which is replaced as required. To attach the chuck jaw piece to a regular jaw, it is slipped over the regular jaw and tightened with a setscrew. The soft insert is attached to this piece with two socket-head setscrews and may be changed without removing the jaw piece. Thus, instead of changing the entire jaw, only the insert is replaced. *C H Winterburn, Jackson, Michigan*



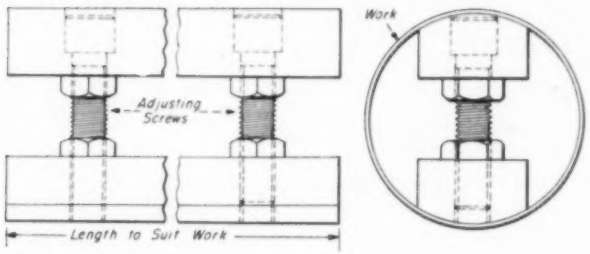
Machinist's Stethoscope

An old earphone from a radio headset can be used to make a useful stethoscope for listening to and locating noises in machines. Remove all of the electrical parts and use only the case, its cover, and the diaphragm. Drill a hole in the latter, directly in the center, and attach a long metal rod by means of a machine screw. Another center hole is drilled at the back of the case, to allow the rod to pass through and is drilled large enough so that a small rubber grommet can be inserted to fit tightly around the rod.

For use, the end of the rod is placed on a portion of the external housing of an operating machine. When the ear is placed against the ear-piece, noises within the machine will be heard very distinctly.

People who have used a similar stethoscope may not know that a set of diaphragms of various thicknesses and different materials can be made to respond to specific sound frequencies. Thus, these sounds can be segregated.

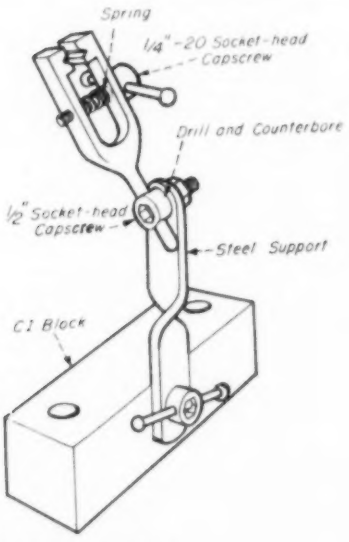
Noise is both useful and irritating (Noise, A Shop Problem—*AM* —Dec 22 '52, p109). With a little practice, this stethoscope, and a set of diaphragms, many shop troubles can be located when, or before, they occur. *Haim Murro, Boston, Mass.*



Adjustable Formblock for Sheetmetal Work

This tool is handy to have around the bench for sheetmetal work, especially if a large part of the work is with rolled sheet stock. It can be effectively used for riveting, soldering, seaming, and a variety of other jobs done on rolled tubes. To take many different diameters, the tool is adjustable by means of two bolts, and it is easily constructed.

Two lengths of steel (which can be hardened for better wear qualities) are machined to provide a radius on one side of each. One piece is drilled and counterbored for a standard socket-head screw, while the other is tapped. Two jam-nuts on each screw hold the size after the diameter is set. When a different size is desired, the jam-nuts are loosened and the anvil is adjusted with a socket key. *Roger Isetts, Kenosha, Wisc.*

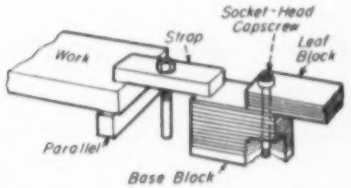


Spring Jaw Vise for Small Parts

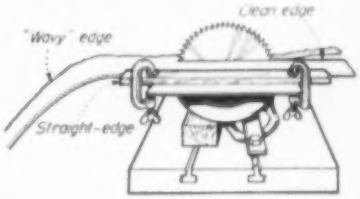
To correctly position small work for soldering, filing, or other bench operations requiring specific angles, a small spring jaw vise is extremely handy. It can be made very quickly; consists of a slingshot-shaped vise having a ¼-in. dia handle fastened to a strip of ¼-in. thick x 1-in. wide flat stock (crs) twisted 90°. The vise-jaws are hinged at the fork and a spring is placed on the screw between the jaws, to hold them apart for loading. One ¼-20 socket head capscrew is used to adjust the jaws. A 3/16-in. dia hole is drilled through the head of the screw and a steel pin is inserted as a handle. A 33/64-in. dia hole is drilled at each end of the steel support. The upper hole is also counterbored to apply pressure on the vise handle, which is inserted in a hole drilled in the head of the ½-13 socket-head bolt used to support it. Another ½-13 socket-head bolt is used to fasten the opposite end of the steel support to a steel or cast iron block for benchwork. The head of this bolt is drilled for a pin handle. The steel support may also be clamped in a bench-vise or bolted to the bench edge. *C H Willey, Penacook, N H*

Leaf Clampblock Saves Setup Time

How often have you looked all over the shop until you found the right height clampblock to set up a milling machine or a planer? We got tired of searching and devised the leaf block shown. It can be made to suit the sizes most frequently required in your shop; ours totals 2½-in. high. The stock consists of

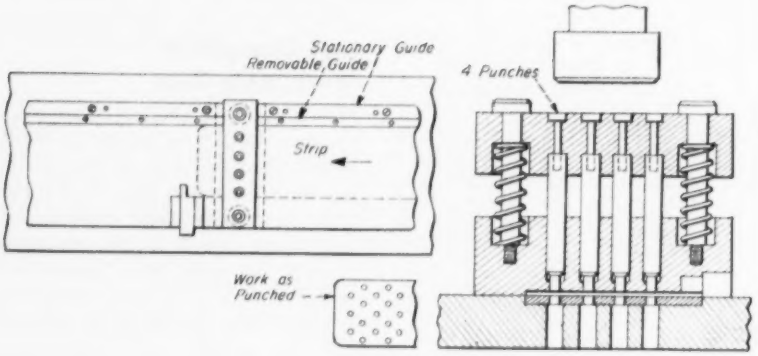


a ½ x 1¼ x 3½-in. base block and 16⅛-in. leaves, made by shearing 3½-in. lengths from a strip of ⅛ x 1¼-in. crs. A 17/32-in. dia hole was drilled through all of the leaves and the base block was drilled and tapped for a ¼-20 thread. A ¼-20 socket-head capscrew was inserted through the holes and fastened into the base block. To adjust the block to the proper height, as many leaves as necessary are swung out of the way. *R J Mottl, Chicago, Ill.*



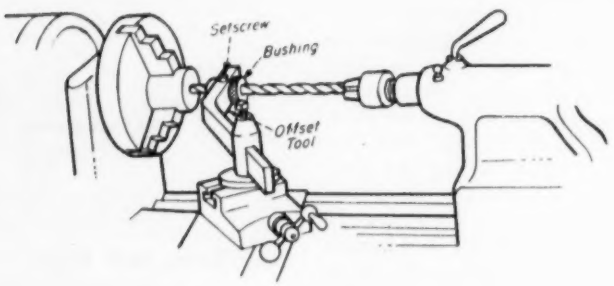
Saw Trims Belt Edge

Recently, I was supplied with a 15-ft length of ⅜-in. thick x 3-in. wide leather belting that had been cut from a 6-in. width. The cut edge was very rough. Turning a portable circular saw upside-down, I clamped it on a planer table. Then I aligned a piece of ½-in. sq x 18-in. long wood on the depth stop at the proper distance from the blade and clamped it with C-clamps. By simply drawing the belt between the sawblade and the straightedge, it produced a clean, smooth edge. *David Willis, Kingston, Ontario*



Punch-Press Tooled for Perforating

This tool provides a low-cost method of perforating short-run jobs when only conventional punch-presses are available. Regardless of the length of stroke, this device can be set to move the punches only slightly more than the stock thickness. A standard flattening punch is inserted in the ram and the perforating tool is placed beneath it and bolted to the bolster. The punch holder is set up for four holes and the material is punched for the required length. Then, the guide-spacer is repositioned and the material is fed through the tool again to punch the next row of holes for the required length. An ordinary hand-operated trigger stop is used but if the quantity warrants it, the trigger stop can be replaced with an automatic feed. Wear is negligible and the perforating tool we built has produced thousands of pieces without maintenance. *Stuart E Wadsworth, Homer, N Y*



Drill Without Centering

When it is necessary to drill a large quantity of pieces in a lathe chuck, the work of centering each piece can be avoided by using a toolpost bushing. This device will align the drill on center and will prevent wobble. A conventional offset toolholder can be used by drilling and reaming a hole of sufficient diameter through the toolholder, just behind the toolbit slot, to provide a push-fit for the bushing. A second, smaller hole is drilled and tapped from the top of the toolholder into the bushing hole, to allow the bushing to be setscrewed. The hole for the bushing should permit the use of standard bushings, so that it will handle a variety of drill-sizes. This method is particularly useful for drilling deep holes. *C H Willey, Penacook, N H*

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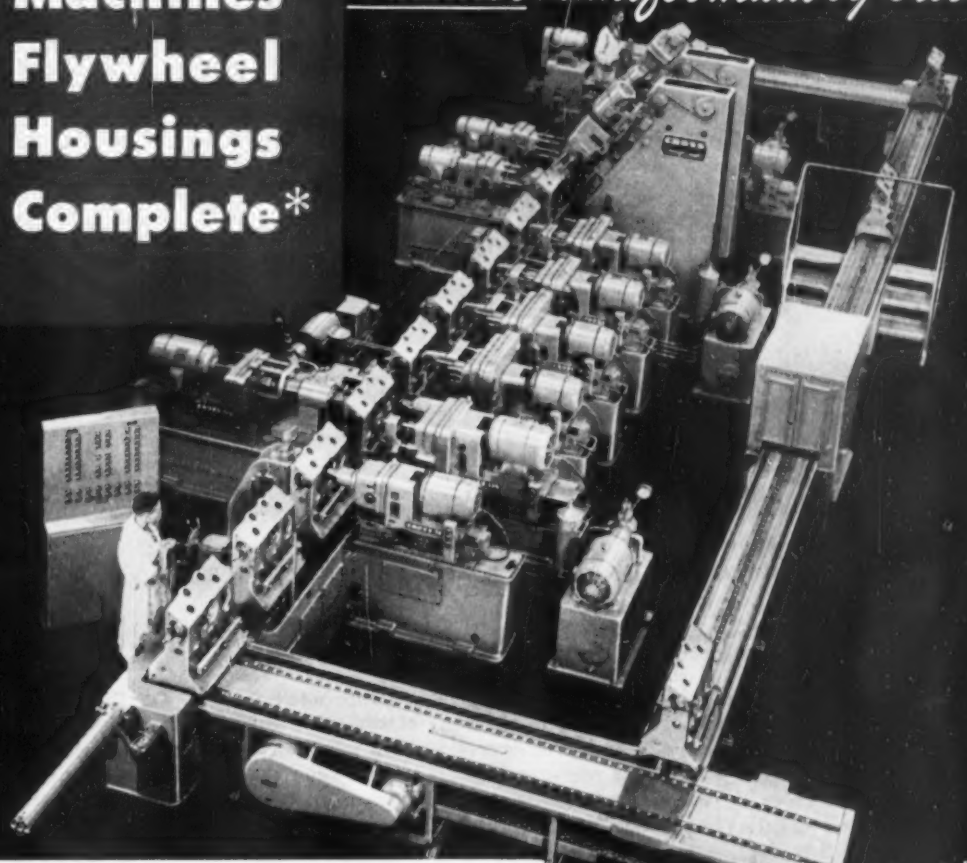

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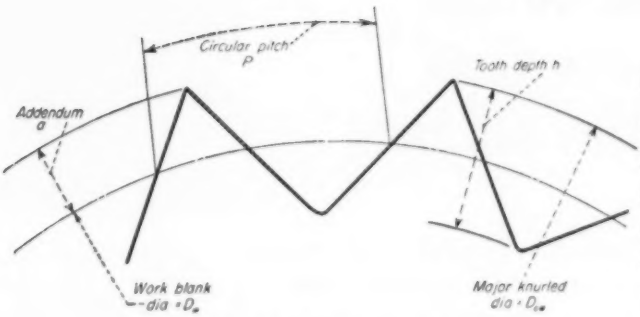


P = dia pitch = $\frac{N_w}{D_w}$

D_w = work blank dia = $\frac{N_w}{P}$

N_w = no. of teeth on work = $P \times D_w$

P = circular pitch on work blank dia = $\frac{\pi}{P}$

h = tooth depth

a = "addendum" of tooth on work = $\frac{D_{ow} - D_w}{2}$

D_{ow} = major knurled dia = $D_w + 2a$

FIG. 5 . . Relationships in straight-tooth knurling

Diagonal Knurling with Straight-Tooth Tools

Diagonal knurling on the work blank may be accomplished by setting the axis of the knurling tool at an angle to the work axis, Fig. 6.

Where:

Ψ = angle between tool axis and work axis
P = diametral pitch on tool
$P\Psi$ = diametral pitch produced on work blank by setting tool axis at an angle M with respect to work blank axis
D_w = diameter of work blank
N_w = number of teeth produced on work blank

then

$$P\Psi = P \cos\Psi$$

and

$$N_w = D_w P \cos\Psi$$

For example, if 30° diagonal knurling is to be produced on 1 in. stock with a 160 P straight knurl:

$$N_w = D_w P \cos \Psi$$
$$= 1.000 \times 160 \times 0.86603$$
$$= 138.56$$

Good tracking is theoretically possible by changing the helix angle as follows:

$$\Psi = \cos^{-1}\left(\frac{N_w}{D_w P}\right)$$

$$= \cos^{-1}\ (0.8625) = 30\tfrac{1}{2}^\circ \text{ approx.}$$

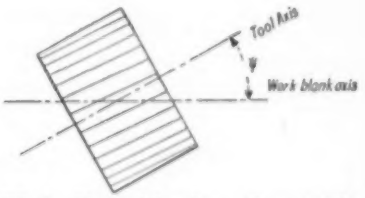


FIG. 6 . . Diagonal knurling with a straight-tooth knurl is accomplished by setting the tool to angle Ψ with the work axis

$$= \cos^{-1}\left(\frac{138}{1 \times 160}\right)$$

Whenever it is more practical to machine the stock, good tracking can be obtained by reducing the work blank diameter as follows:

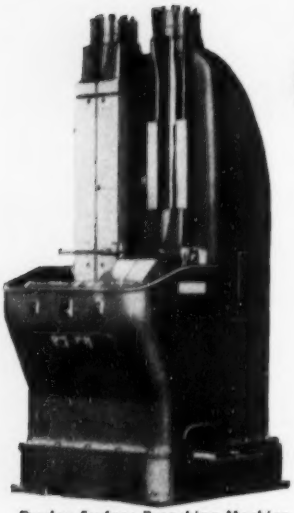
$$D_w = \frac{N_w}{P \cos \Psi} = \frac{136}{160 \times 0.866}$$
$$= 0.996 \text{ in.}$$

Table III . . SPECIFICATIONS for STRAIGHT- AND DIAGONAL-TOOTH CYLINDRICAL KNURLS

Diametral Pitch P	Major Dia. of Cylindrical Knurl tol. +.0000, —.0015				Tracking Correction Factor Q	Total Depth tol. +.0004 —.0015		Radius at Root	Approx. Space Angle (between sides of adjacent teeth)		Eccentricity of Teeth
	Nom. Dia. ⅛	Nom. Dia. ⅙	Nom. Dia. ¼	Nom. Dia. ⅜		Straight	Diagonal		Straight	Diagonal	
64	.4932	.6165	.7398	.8631	.0006676	0.024	0.021	.0070 .0050	82°	82°	0.002
96	.4960	6200	.7440	.8680	.0002618	0.016	0.014	.0060 .0040	82°	82°	0.002
128	.4972	.6215	.7458	.8701	.0001374	0.012	0.010	0045 0030	82°	82°	0.002
160	.4976	.6220	.7464	.8708	.00009425	0.009	0.008	.0040 .0025	82°	82°	0.002

NUMBER OF TEETH = DIAMETRAL PITCH × NOMINAL DIAMETER

The different nominal diameters of knurls are used to meet established requirements of toolholders, machine sizes, and contour of the work.



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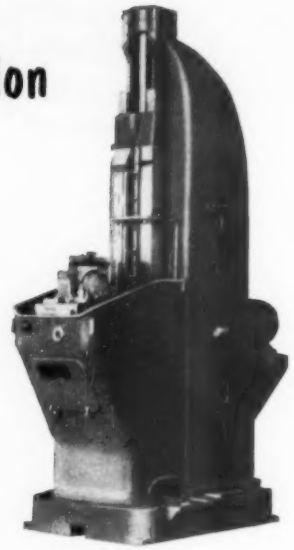

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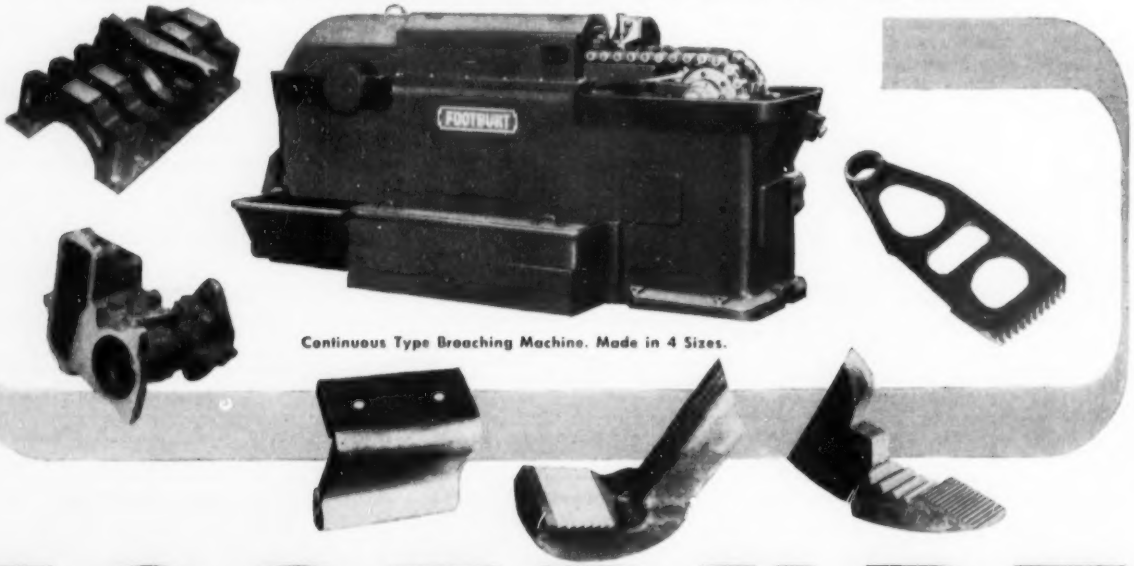

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Knurling...V

table IV . . KNURLING DATA FOR FRACTIONAL BLANK DIAMETERS USING STANDARD DIAMETRAL PITCH KNURLING TOOLS

DIAMETRAL PITCH		160		128		96		64	
APPROXIMATE DEPTH OF TOOTH OR INCREASE IN KNURLED DIA.		0.009		0.012		0.016		0.024	
DIA. OF BLANK*		Knurled Diameter	No. of Teeth in Knurled Circum.	Knurled Diameter	No. of Teeth in Knurled Circum.	Knurled Diameter	No. of Teeth in Knurled Diameter	Knurled Diameter	No. of Teeth in Knurled Circum.
3/32	0.094	0.103	15						
1/8	0.125	0.134	20						
9/64	0.141			0.153	18				
5/32	0.156	0.165	25	0.168	20				
11/64	0.172			0.184	22				
3/16	0.188	0.197	30	0.200	24				
13/64	0.203			0.215	26				
7/32	0.219	0.228	35	0.231	28				
15/64	0.234			0.246	30				
1/4	0.250	0.259	40	0.262	32	0.266	24		
17/64	0.266			0.278	34				
9/32	0.281	0.290	45	0.293	36	0.297	27		
19/64	0.297			0.309	38				
5/16	0.312	0.321	50	0.324	40	0.328	30		
21/64	0.328			0.340	42				
11/32	0.344	0.353	55	0.356	44	0.360	33		
23/64	0.359			0.371	46				
3/8	0.375	0.384	60	0.387	48	0.391	36	0.399	24
25/64	0.391			0.403	50			0.414	25
13/32	0.406	0.415	65	0.418	52	0.422	39	0.430	26
27/64	0.422			0.434	54			0.446	27
7/16	0.438	0.447	70	0.450	56	0.454	42	0.462	28
29/64	0.453			0.465	58			0.477	29
15/32	0.469	0.478	75	0.481	60	0.485	45	0.493	30
31/64	0.484			0.496	62			0.508	31
1/2	0.500	0.509	80	0.512	64	0.516	48	0.524	32
33/64	0.516			0.528	66			0.540	33
17/32	0.531	0.540	85	0.543	68	0.547	51	0.555	34
35/64	0.547			0.559	70			0.571	35
9/16	0.562	0.571	90	0.574	72	0.578	54	0.586	36
37/64	0.578			0.590	74			0.602	37
19/32	0.594	0.603	95	0.606	76	0.610	57	0.618	38
39/64	0.609			0.621	78			0.633	39
5/8	0.625	0.634	100	0.637	80	0.641	60	0.649	40
41/64	0.641			0.653	82			0.665	41
21/32	0.656	0.665	105	0.668	84	0.672	63	0.680	42
43/64	0.672			0.684	86			0.696	43
11/16	0.688	0.697	110	0.700	88	0.704	66	0.712	44
45/64	0.703			0.715	90			0.727	45
23/32	0.719	0.728	115	0.731	92	0.735	69	0.743	46
47/64	0.734			0.746	94			0.758	47
3/4	0.750	0.759	120	0.762	96	0.766	72	0.774	48
49/64	0.766			0.778	98			0.790	49
25/32	0.781	0.790	125	0.793	100	0.797	75	0.805	50
51/64	0.797			0.809	102			0.821	51
13/16	0.812	0.821	130	0.824	104	0.828	78	0.836	52
53/64	0.828			0.840	106			0.852	53
27/32	0.844	0.853	135	0.856	108	0.860	81	0.868	54
55/64	0.859			0.871	110			0.883	55
7/8	0.875	0.884	140	0.887	112	0.891	84	0.899	56
57/64	0.891			0.903	114			0.915	57
29/32	0.906	0.915	145	0.918	116	0.922	87	0.930	58
59/64	0.922			0.934	118			0.946	59
15/16	0.938	0.947	150	0.950	120	0.954	90	0.962	60
61/64	0.953			0.965	122			0.977	61
31/32	0.969	0.978	155	0.981	124	0.985	93	0.993	62
63/64	0.984			0.996	126			1.008	63
1	1.000	1.009	160	1.012	128	1.016	96	1.024	64
RECOMMENDED TOLERANCE ON KNURLED OUTSIDE DIAMETERS	CLASS I	+0.002 −0.006		+0.003 −0.008		+0.004 −0.010		+0.005 −0.012	
	CLASS	+0.000 −0.003		+0.000 −0.004		+0.000 −0.005		+0.000 −0.006	
RECOMMENDED TOLERANCE ON O.D. BEFORE KNURL. (REF.)		±0.0005		±0.001		±0.0015		±0.002	

Theoretical work blank diameters on which standard pitch knurls may be expected to track have been listed in Table II, for the four standard diametrical pitch knurling tools and for helix angles of 25, 30, 35, 40, and 45°.

Tolerance on Knurled OD

Two classes of tolerances are included in Table V. These classes and recommended applications are as follows:

Class I—Tolerances in this classification may be applied to straight, diagonal, and raised diamond knurling where the knurled outside diameter of the work need not be held to close dimensional tolerances. Applications include knurling for decorative effect, grip on thumb screws and knobs, and inserts for moldings and castings.

Class II—Tolerances in this classification may be applied to straight knurling only and are recommended for application requiring closer dimensional control of the knurled outside diameter than provided by Class I toler-

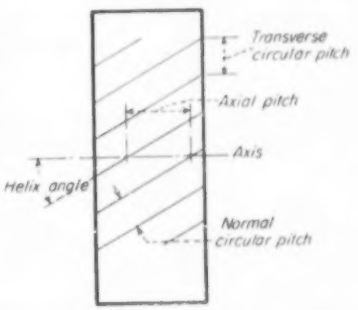

FIG. 7 . . In diagonal-tooth knurling, circular pitches are measured on the work-blank diameter, and diametral pitch is based on the transverse circular pitch. Apply same formulas as for straight teeth and substitute transverse circular pitch for circular pitch. The same nomenclature applies to diamond-pattern knurls

←

USE OF 64 DP KNURL should be avoided as much as possible. For simplification of tools it is recommended that preference be given to use of 96 DP; in the case of Diamond Knurling, the raised pattern on work should be specified.

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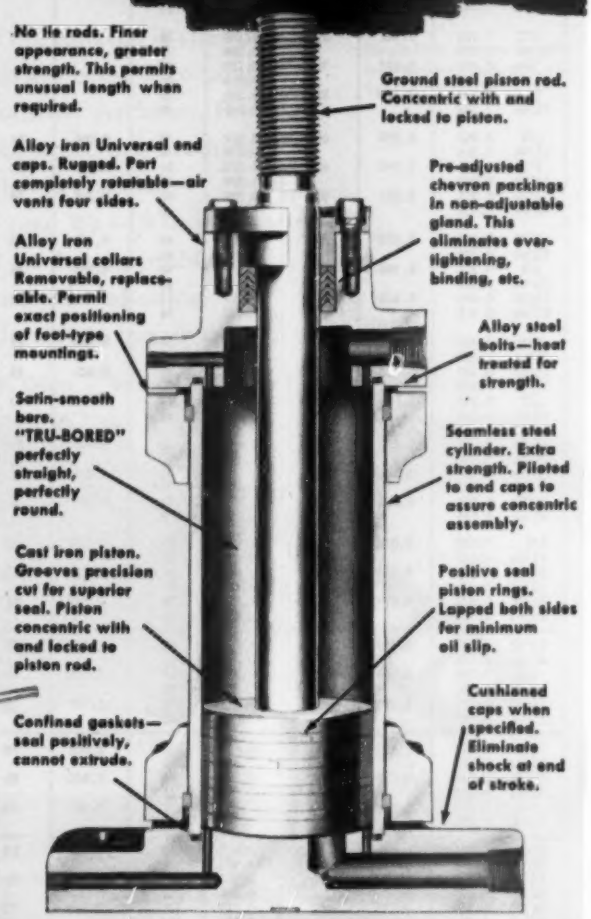
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Knurling...VI

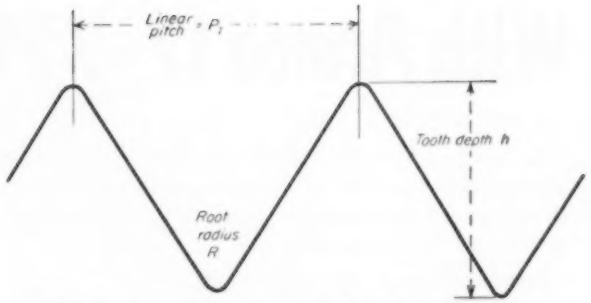


FIG. 8 . . Nomenclature for a flat die with straight teeth

R = radius at root

P = dia pitch = $\frac{N_w}{D_w}$

D_w = work blank (pitch) dia = $\frac{N_w}{P}$

N_w = no. of teeth on work = $P \times D_w$

h = tooth depth

Q = tracking correction factor applied to linear pitch on die

P_1 = linear pitch on flat die = $P - Q$ or $\frac{\pi}{P - Q}$

ances. Such applications include knurling for close fits or best possible appearances.

Markings for Knurls and Dies

Knurls and dies should be suitably marked to indicate diametral pitch, and if diagonal the helix angle and right or left hand angle *produced on work*. Angle on tooth is *opposite* to that produced on work.

Tracking-Correction Factor Q

Use of the preferred pitches for cylindrical knurls, Table I, results in good tracking on all fractional work-blank diameters, which are multiples of 1/64 or 1/32 in., depending on the pitch selected.

To accomplish this, the work surface must be evenly marked during the first revolution of the work, which requires pitch circles to roll without relative slippage. Therefore, extent of penetration of the work by the knurl during the first revolution must be considered. Because of the many variables involved in knurling practice such as cam contours, hardness of the material, elasticity of machine tools and toolholders, etc., the method of determining the required correction is necessarily empirical.

Accordingly, the tracking correction factor, Q, has been incorporated in knurl specifications, Table III, on the basis of experimental work and experience, and provides good tracking for general knurling conditions.

Dimensioning

Uniform drafting practice is important. Essential dimensioning, to be complete, should include width, outside diameter and diameter tolerance of knurling when necessary. It should also include diametral pitch and style of knurling as shown in Fig. 9.

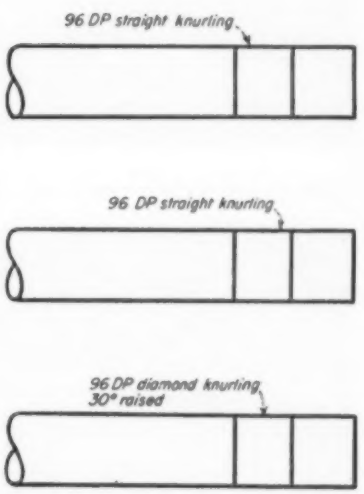


FIG. 9 . . Dimensioning for knurling should include diametral pitch and style for knurling

table V . . TOLERANCES ON KNURLED WORK*

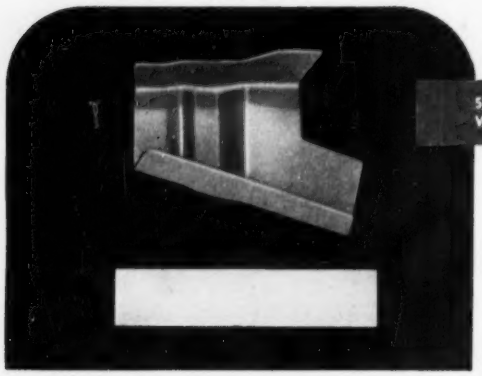
DIA PITCH	160	128	96	64
	RECOMMENDED FOR KNURLED OD			
Class I	+0.002 −0.006	+0.003 −0.008	+0.004 −0.010	+0.005 −0.012
Class II	+0.000 −0.003	+0.000 −0.004	+0.000 −0.005	+0.000 −0.006
	RECOMMENDED ON OD BEFORE KNURLING			
	±0.0005	±0.001	±0.0015	±0.002

* Use these data with Table IV

table VI . . SPECIFICATIONS for FLAT KNURLING DIES

Diametral Pitch P	Linear Pitch P_1*	Tooth Depth, h	Radius at Root, R
64	0.0484	0.024	0.0070 0.0050
96	0.0325	0.016	0.0060 0.0040
128	0.0244	0.012	0.0045 0.0030
160	0.0195	0.009	0.0040 0.0025

*The linear pitches shown in the table are theoretical. The exact linear pitch produced by a flat knurling die may vary slightly from the figures in the table, depending upon the rolling condition and the material being rolled.



Stainless structural parts for airplanes. White rule represents 6 inches.

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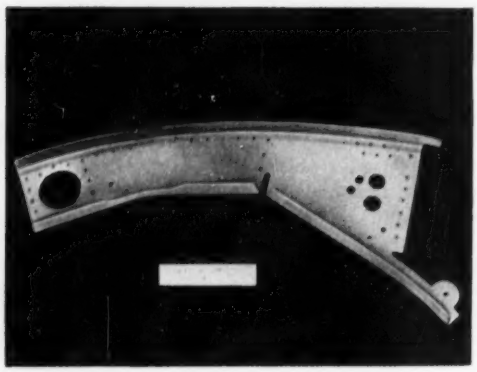

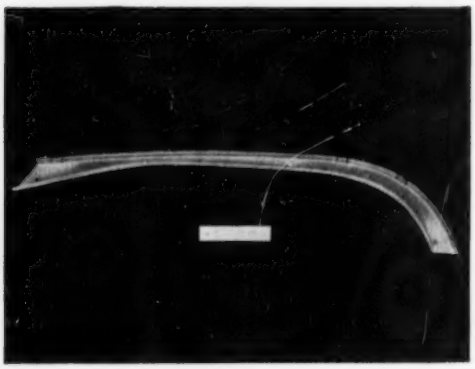

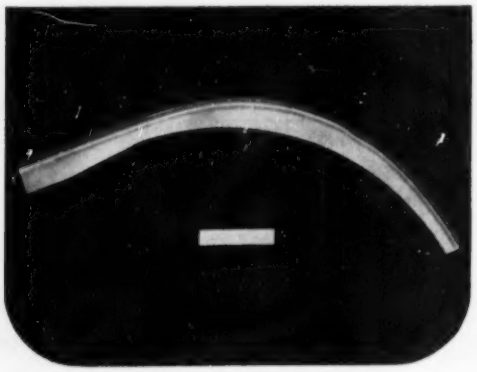

Vital formed structurals in certain airplane fuselages formerly were made of Type 301 half-hard temper stainless steel. Here is what the manufacturer gained by changing over to Armco 17-7 PH Stainless Steel:

50-94% INCREASE IN YIELD STRENGTH

Instead of a yield strength in tension of 110,000 psi minimum, he had his choice of yield strengths as high as 165,000 psi minimum in finished parts.

Yield strength in compression could be increased correspondingly from 85,000 psi to as high as 165,000 psi minimum.

23% INCREASE IN TENSILE STRENGTH

Ultimate tensile strength of the finished structural parts could be increased from 150,000 psi minimum to as high as 185,000 psi.

IMPROVED WORKABILITY

Fabrication difficulties were also overcome. Half-hard temper Type 301 must be worked in the hard condition. With an elongation of only 15-18 per cent in 2", it is difficult to form and results are often inconsistent.

On the other hand, Armco 17-7 PH may be worked in the fully annealed condition and hardened by heat treatment *after fabrication*. With an elongation of 20-40 per cent in 2", it will take far more severe forming than Type 301, half-hard. Its high strength is developed through a double low-temperature heat treatment of 1400 F plus 950-1050 F. Scale developed in heat treatment comes off readily in sandblasting.

This is but a thumb-nail sketch of the advantages of Armco 17-7 PH in structural applications. Write for complete information on this precipitation-hardening chromium-nickel stainless steel.

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TALKING SHOP

Diamonds in the Dust

PLANTS THAT GRIND sizeable quantities of carbide tools with diamond wheels should look into the possibilities of salvaging diamond chips from sludge traps in coolant systems, or from dust collectors in dry-grinder exhaust systems. K R Beardslee, general manager of the Carboloy Dept, General Electric Co, recently told us that his organization currently is recovering upwards of 2,500 carats of diamond chips per month through a carefully organized salvage plan. Even the paper wipers used to clean wire-drawing dies following diamond lapping are saved so the diamond particles they pick up can be salvaged. Few users of carbide tools use enough diamond wheels to approach the monthly savings quoted by Mr Beardslee—but another plant told us recently that it gets back about 200 carats of diamonds from every drum of sludge shipped to its contract salvager. Chrysler also reported, several months ago, salvage of diamond powder worth a quarter-million dollars a year.

Feel Test

WE WERE STROLLING through a plant with the methods man, an oldtimer, and came upon a special tooling job he wanted to show off. No operator was in sight. The methods man picked up several of the top finished pieces in the tote box, then a couple lying on chips on the fixture. "Guess he's gone somewhere out of reach," he said. Then we tumbled to the fact that he'd reached his conclusion by feeling the pieces to see how warm they were. Warm pieces would indicate the operator had just gone, and might be right back. But these were cold.

Hope or Hobgoblin?

FEAR OF MODERN TECHNOLOGY and misunderstanding of its productive role underlie much of the world's current uneasiness, according to Henry B du Pont, a vice-president of the Du Pont Company, speaking at the annual convention of the Association of Land-Grant Colleges and Universities. He urged college professors to "spend some time with a modern industrial organization" as a means of appraising industrial developments realistically. He noted that "the fruits of technological progress reach the public through the medium of American industry" and that thorough understanding of all financial, technical and economic requirements are essential. Technology and industry "are almost synonymous," he said. "To praise technology and condemn industry . . . is like favoring education but condemning the university."

The colleges, he said, can clarify much of the misunderstanding of this process by broadening the educational background of both students and faculty.

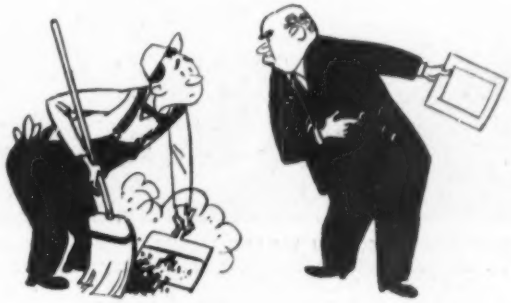
Save $9.96 per Hp-hr

"THE BASIC PROBLEM we all face is to recognize a materials-handling operation when we see it," said R C Sollenberger, executive v p, Conveyor Equipt Mfrs Assn, speaking at the 4th Biennial Materials Handling Conference sponsored by Westinghouse. "Because man has developed over the centuries that most perfect of all materials-handling machines, the human hand, he is likely to take for granted those materials operations he performs and, also, to take for granted those operations being performed by others. A materials-handling cost is involved in industry whenever an object or a material is moved, shoved, lifted, rolled, adjusted or merely touched. The Twentieth Century Fund reports that power developed by human muscles costs on the average of $10 per horsepower-hour. Man made some savings when he employed animal muscles, but his power still set him back about 75 cents per hp-hr. Electricity costs him 4 cents or less. Think that over the next time you see some chap wrestling a crate, or a box, or a casting around your shop—you might save a fast $9.96 per hp-hr by giving him an electric motor to do the job."

Name to Live Up To

WE RECENTLY PUBLISHED a photo of a tricky shop setup. Taken by the shop photographer, it showed a dirty floor and messy shopkeeping generally. Our retouchers cleaned up the photograph before we made our engraving. Happily, the shop man who had provided the story showed the picture to his works manager—and met blank denial that the photo could have been taken there. When convinced that our retouchers had given the shop a face-lifting, the works manager said: "That's a lesson for us! There's no sound reason why our plant shouldn't look like that all the time. From now on, it's going to look like that, or I'll know the reason why!"

PS: It does look like the picture, *now*—and the shop man who started it is still unhappy. We're sorry—in a pleased sort of way.



News of Metalworking

MATERIAL HANDLING INSTITUTE ELECTS '53 OFFICERS

NEW YORK—Howard M Palmer of Lewis-Shepard Products, Inc, was elected president of Materials Handling Institute for the year during the annual meeting here, Dec 18. Charles B Elledge of General Electric Co and Walter E Schiemer of Clarke Equipment Co were elected first and second vice presidents. Retiring president is L West Shea of Union Metal Mfg Co, who now becomes a director of the association.

MHI will continue aid to industry by sponsoring exhibits, conferences, publications, and committee activities aimed at better efficiency in materials-handling methods. Member companies did $1¼ billion worth of business last year.

F D VAN NORMAN HONORED AT LUNCHEON

SPRINGFIELD, Mass—Over 200 industrialists of this area paid tribute to Frederick D Van Norman, chairman of the board and founder of Van Norman Co, on Dec 13. The occasion was Mr Van Norman's 90th birthday.

Toastmaster was James Y Scott, president of the company. Speakers included Springfield Mayor Daniel D Brunton, works manager Edward G Brogan, and senior-director Henry A Field.

Mr Van Norman was the designer of early precision bore-grinding equipment, and has had a major part in patent applications.

Military Production Steadies, Approaches Plateaus in Some Lines

WASHINGTON—Overall production of military items is still on the rise, though slowly. Long-lead-time items like airplanes are yet approaching a peak, while materials that require shorter production periods, like tanks, have already passed peaks under current plans. Major weapons programs are at these points:

• **Tanks** — Light-tank production is being slowed because of accumulating inventories, as at Cadillac's Cleveland tank plant. Heavy tanks are not being produced except experimentally, and are likely to stay in this stage unless a major effort is required. Medium tanks will be produced at current rates well into the year, with production of the M-47 being wound up in 1953, and M-48 (Patton) production being slowed only by next year. By the end of '53, only two plants—Chrysler's Newark, Delaware, plant, and GM's Flint, Mich, factory—will be making mediums. American Locomotive, Ford, and Detroit Tank Arsenal will stop their present production by then.

Tank production has generally been going well, and this factor and the light tank action in Korea have raised existing quantities. Offshore procurement—largely of British Centurions—will take care of most of NATO's needs.

• **Aircraft** — Present plans require 28,000 planes over the next three years, and schedules to meet this goal are being 98% met right now. Air Force will get 21,000 planes, Navy 6000, and the rest are civilian transport ships.

Roswell L Gilpatrick, AF undersecretary, figures the peak in plane production will be hit in February, this year. Deliveries to Air Force last November were 670 units; they will rise to 750 in January, and peak at 800 next month. A gradual drop-off in deliveries will start in 1954, and production will level again at an undisclosed replacement plateau. The total peak, including Navy and NATO requirements, will be around 1100 planes per month. By early Spring the delivery of engines should be around 3000 a month.

Some major changes—prompted by DPA's Campbell report—are due, however, including the phasing out of B-36 production by 1954. Convair will build multi-jet supersonic bombers, instead. Another change is an Air Force order for a $15-million correction of design in the F-89 Northrup Scorpion nightfighter, plus cutback of F-89 production, which will now last only into 1955 instead of 1958.

The Lockheed F-94C Starfire, Allison's J-35 axial-flow jet engine, Allison's J-33 centrifugal-flow turbojet, Pratt & Whitney's J-48 turbojet and its R-2800 piston engine have been cut back.

Navy has ordered a 20% cutback in Grumman F9F-6's, which are Cougar jets with swept-back wings, although some production of the Grumman F9F-7, using a J-33 Allison engine, will continue. The piston-engine Douglas Skyraider AD-5 has been cut back 13%, but Navy wants more production on the Douglas A2D Skyray gas-turbine-driven attack bomber.

Most of these cutbacks will be offset either by increased production of ships now being made or by newer models not yet on the lines. Some planes to be ordered in quantity are: Douglas RF-66, a twin-jet bomber the Navy designates as A3D-1; Convair F-102 delta-wing fighter; North American F-100; and Chance Vought

HARDTOP CONVERTIBLE IS NEW WILLYS MODEL. Company has announced lower prices on '53 cars; will celebrate 50th anniversary this year on Lincoln's Birthday

swept-wing Cutlass Navy fighter.

• **Small Arms** — A new Army rifle is probable, although disagreement with the British on the exact model might hold this big change up a long time. The Garrand M-1 was brought out in 1936, and is due for a replacement. Army has two similar models that are 2 lb lighter and fire automatically — the M-1 is semi-automatic, which means the trigger must be pulled for each shot; automatic means the rifle fires rounds as long as the trigger is held down. The British have a new model, too, although it fires a lighter slug — .276 cal — than the US .30 cal, and US ordnance men claim it hasn't enough stopping power. The objective of both nations, however, is a standard rifle that will eliminate considerable trouble when forces of both countries are fighting together on the same field, and when one service has ammunition handy and the other hasn't.

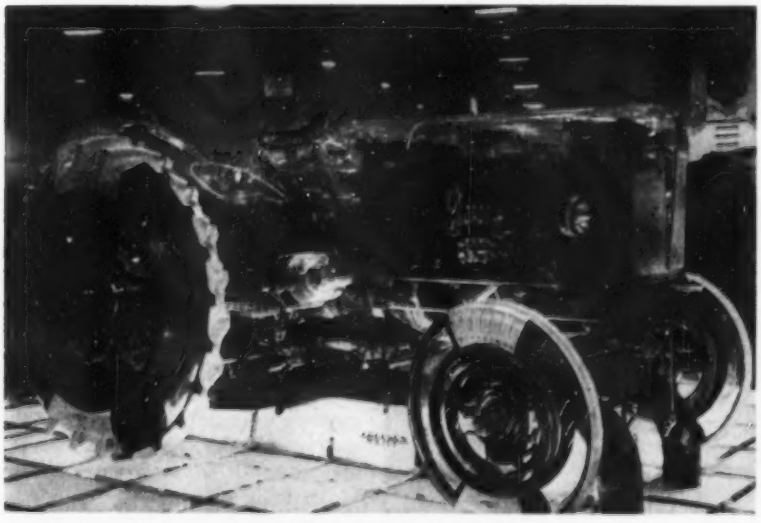
Tool-and-Die Film Will Stress Work Dignity

NEW YORK—A sound-color moving picture that will show work done and training facilities in member shops is planned for release by the National Tool & Die Manufacturers' Assn as a result of alarm over public ignorance of the opportunities in skilled employment. Purpose of the film is to sell educators and parents on the industry—particularly apprenticeship in the tool-and-die trade—as a means of obtaining training and skill to do creative work.

Title of the 20-minute one-reeler is to be "The Tool & Die Worker—America's Modern Frontiersman." NTDMA hopes to offset the notion that young men should be funneled into white-collar jobs, regardless of potential income, ease of employment, and work satisfactions.

NTDMA, according to speakers at a recent panel discussion, is not happy about the results of vocational education. Educators suggest vocational schooling for misfits, they said, with IQ's of 75 to 80, whereas no more than four or five graduates of high school out of 100 would be worth bothering with in a tool-and-die apprenticeship program. Industry needs young men with IQ's of 120 or over, which is actually higher than college-entrance requirements.

The film is expected to prove that the work does not involve a loss of "class," but actually provides stimulus and income not normally available to high-school graduates in the labor market. Emphasis will be placed on the problems faced in solving tooling needs for tomorrows new products.



SURPRISE EXHIBIT AT LONDON AGRICULTURAL SHOW was Fordson Major tractor, (shown here in plastic mockup) designed for commercial hauling at docks, railroad yards, and factories. Drawbar allows hitching and unhitching with operator remaining on seat. Six forward speeds range from 1 to 16 mph

Business Items

Columbia Machinery & Engineering Corp has acquired the assets and manufacturing rights of **Bridgeport Safety Emery Wheel Co,** whose production will be continued, and of **Diamond Machine Co,** on whose equipment service only will be continued. Both companies will be integrated with Columbia's Hamilton, O, div.

Controlling interest in **Toledo Metal Furniture Co** has been obtained by a group of investors headed by Thorley C Mills, who has been elected president and treasurer of the firm.

Ownership of **Lehmann Machine Co** has been purchased by Harold and Joseph Schott, who will continue operation of the plant in current lines.

Detroit Harvester Co has added **Clinton Machine Co's Warner Div** to its list of divisions through outright purchase. The plant will augment hydraulic manufacturing facilities of the buyer.

Ferry Cap & Set Screw Co has purchased **Ohio Machine & Boiler Co** in a move to simplify expansion of both plants.

Stewart-Warner Corp has acquired **US Machine Co** in exchange for stock, the aim being increased SW productive capacity and augmentation of US Machine's Winkler Line of products.

Basco Manufacturing Co has been organized to make sheet-steel separators that permit automatic magnetic separation of stacked sheets. The products were formerly marketed by D C Canfield of New Britain, Conn.

SPO, Inc, and **Shellmold & Machine Co** have a new arrangement whereby Shellmold may use SPO facilities to make shellmolding equipment and machinery.

Balmer Corp, manufacturing subsidiary for Franklin Railway Supply Co, has had its name changed to **Franklin Balmar Corp** to better identify the nature of business conducted.

Copperweld Steel Co will produce Ledloa steel—stainless, alloy, and carbon—under license from Inland Steel Co at its Warren, O. plant.

The Swedish firm of **Lunden & Bonthron,** Stockholm, machine-tool builders, have changed their name to **Aktiebolaget Lunden & Lindhe.** The change is formal, only, and will not have any effect on the Products of the firm.

Plant Expansions

Fairfield Engineering Co, maker of conveying and mixing equipment, will build a 21,000-sq-ft plant at Marion, O, for added production space.

U S Steel has opened its 15th distributing warehouse at Houston, Tex, to carry complete stocks of bar, shapes, plates, strip, and sheet for the Southwest industrial area.

Trailmobile, Inc, has inaugurated a six-months expansion program that will cost over $1 million, and will enlarge engineering facilities as well as establish the service-parts department at a new location.

Armco Drainage & Metal Products, Inc, is building a new fabricating plant at Mansfield, Pa, where metal pipe and fittings will be made.

Superior Mold & Die Co, Akron, O. will double the capacity of its present plant, adding 7500 sq ft, and requiring 80 new employees.

Union Metal Mfg Co expects to begin production of parking meters in a month at its new Brampton, Ontario, plant, and will make switch boxes and other parts later.

General Electric Co continues decentralization with a new plant at Linton, Mich, where fractional-hp motors will be built.

Westinghouse Electric Corp will make lighting fixtures at a new Vicksburg, Miss, plant, scheduled to open late next year. The building will be 900 ft long, will employ up to 800.

Air Force Takes a Tilt At Simplified Fighter-Plane Design

WASHINGTON — Critics of gadgeteered military airplanes will be happy to know that the Air Force has asked for a fighter design that will include little more than wings, engine, and guns—which is in direct contrast to current trends. These critics include Bernard Baruch and Senator Lyndon Johnson, who may not have the wholehearted support of the pilots who are flying in Korea on this point. However, the argument that we are killing our own pilots with kindness by adding all the latest heavy electronic gimmicks is a valid question with good points on both sides.

The delta-wing Convair F-102 is typical of advanced aircraft design. The ship is heavy, loaded with electronic gunsights — our best advantage, some claim, over the fast-climbing Mig-15 — automatic pilot, radar, and other highly developed mechanisms. The plane is fast, but utilizes tremendous horsepower and fuel to attain performance that might be reached more easily without all the gadgets.

As for costs, the current rate is about $40 per flying lb. E H Heinmann, chief engineer for Douglas Aircraft, calculates that each added lb of gear requires an extra 10 lbs in the plane—wing, engine, fuel, controls, etc. Thus an extra lb of gear figures out finally at $440.

Wing de-icers weigh 300 lb, the autopilot weighs 110 lb, and the ejection seat for the pilot's safety weighs 100 lb. These add 5100 lbs total and $200,000 to the plane by the above formula. The question as to whether or not these and similar extras can be eliminated or replaced remains open and it may be solved by the new design requirements.

Germany's high aircraft production during the war was based mainly on simplified, standardized design; coupled with fast production that rested on heavy presses. Our heavy-press program is just getting well started, and it will be a year or more before the majority of the presses get into full-scale production. In the meantime, it may be decided that the German concept—simple planes, stamped parts, few gadgets—may be useful, at least for a limited number of aircraft models for specialized interceptor duty.

GIDDINGS & LEWIS HAS OPEN HOUSE

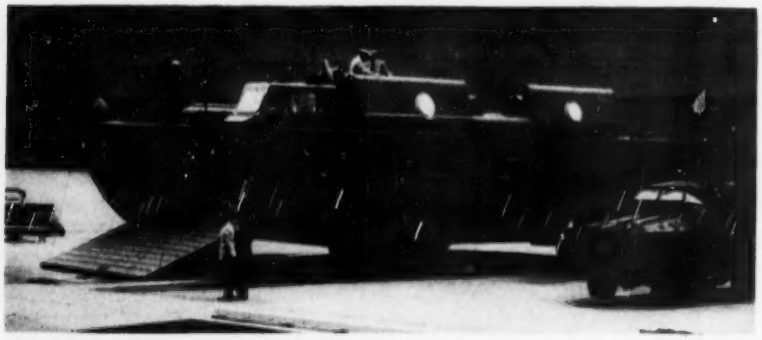
FOND DU LAC, Wis—More than 10,000 people visited four plants of the Giddings & Lewis Machine Tool Co during a two-day open house recently. Selected machines, equipped with explanatory placards, were operated along the visitors' route, which was taken only by people from the surrounding communities. Dealer open houses are carried on separately.

GE CHANGES NAME OF CINCINNATI PLANT

CINCINNATI, O—The General Electric plant here, where J-47 jet engines for the Air Force are built, will now be known officially as the "Evandale" plant, which is a switch from the old Lockland title. Reason is that the township of Evandale has become incorporated.

BOEING ASKS COLLEGE FOR CASTING RESEARCH

SAN FRANCISCO—Boeing Airplane Co has awarded a contract for development work on precision castings, as used in gas-turbine engines, to Washington State College. Purpose is reducing the machining required on the diffuser section of the turbine, for which new designs of match plates and molds will be required.



ARMY'S BARC HAS A 165-HP DIESEL ENGINE FOR EACH WHEEL, synchronized air-controlled shifting, and remote-controlled tire air pressure for variations in footing. It can be steered conventionally, or "crabbed" with rear wheels turned, too. Tires are largest commercially available. Load is up to 100 tons

Final CMP Metals Allocations

WASHINGTON — Last allocations of materials under DPA's Controlled Materials Plan will be for the second quarter of 1953. Based on Pre-Korea levels of utilization, they stack up this way:

- Steel — 70%
- Copper — 50%
- Aluminum — 50%

These allocations for civilian goods amount to 26.1 million tons of steel, 1.6 million lbs of copper, and 841 million lbs of aluminum. In comparison, the previous high for steel was 25.3 million tons in the third quarter of last year, while copper and aluminum allocations are about the same as then.

The auto industry will receive enough steel in April, May, and June to make 1,250,000 cars and 315,000 trucks, but will have authorization to build 1.5 million vehicles.

Metalworking equipment's drop in business—and requirements of materials—is reflected in the fact that NPA has allotted less metal for the second quarter of '53 than in the first. Steel for this section of industry is down 14% to 344,948 tons, copper is down 27% to 21,431,000 lbs, and aluminum is down 48% to 4.6 million lbs.

Critical Industries

Requirements of the Atomic Energy Commission will be met in full; Defense-Department requirements are about 10% down in the second quarter, although the need for steel plate and brass-mill products is slightly up. Cutbacks in tank and vehicle production will not be reflected in these second-quarter allocations.

Auto makers got the bulk of the supplemental allotment of 550,000 tons of carbon-steel sheet that DPA issued just after second-quarter allocations were announced. This gives them enough in the January-through-March period to make a million cars.

Ultrasonics Used to Scrub Metal Parts Clean

NEW YORK — High-pitched sound waves (ultrasonic waves) are directed through a liquid solvent to silently, but thoroughly, remove metal particles, oil, grease, and dirt from the tiny openings and crevices of shaver heads manufactured by Shick, Inc. Parts are immersed in the solution and are withdrawn clean.

"Canned" Motors Pump Radioactive Water in Sub Engine

PITTSBURGH, Pa—Motors driving water-circulating pumps for the nuclear reactor used in the newly-developed submarine engine are, literally, canned. The squirrel-cage rotor is contained in a shrink fit jacket of steel. It turns within a stator that is also fully enclosed with stainless steel. Rather than an air gap, this motor utilizes a combination of water and two layers of metal, the water being the same fluid that is pumped through the reactor circuit. Bearings, too, are inside the stator and are water lubricated.

As with most components of reactor circuits, leakage must be extremely small. Hence, motors cannot drive pumps through seals. The rotor is contained within the fluid circuit; is continuously exposed to water that is hot in terms of temperature and radioactivity. One small unit has been continuously operating for 13,000 hr (1½ yr) at full load, operating temperature, and pressure.

Distributors Named

General Electric Co's welding department is now national distributor of Dryrod electrode ovens.

Metal Finish, Inc, Newark, N J, is distributor of "Honite" barrel-finishing equipment, chips, and compounds, and will handle job work in its own shops.

Control Equipment Co, Atlanta, Ga, will distribute instruments and similar equipment for a number of companies, including Automatic Temperature Control Co and Panellits, Inc.

H S McKenzie Co is new distributor for DeBothezat Fans div, American Machine & Metals Co, and will handle industrial ventilating equipment.

A O Smith Corp's welding-products division will handle Tempil Corp temperature-indicating products on a national basis.

John B Moore Co has announced several new distributors: Norman M Gottfried in Pittsburgh, Caldwell Chemical Co in Detroit, and Arthur K Meyer Co in Los Angeles.

Aviation Products Co, Wichita, Kansas, will represent Transco Products, Inc's line of motor- and manually-operated switches.

Huck Mfg Co, Detroit, will distribute blind rivets for Deutsch Co. Cooper Tool & Engineering Co has the cutting-tool franchise for the Minneapolis area for Standard Tool Co.

Bert Carpenter Co, Birmingham, Mich, will distribute drilling and other machines for Hartford Special Machinery Co.

"FOREIGN LEGION" AT CONSOLIDATED VULTEE COMBATS ENGINEER SHORTAGE by utilizing foreign non-cleared engineers on non-classified projects. All 24 engineers in the project have applied for US citizenship, but clearance procedure is slow. Three US engineers carry on liason between "Ellis Island" and main engineering group

Metalworking Abroad

(By McGraw-Hill World News)

British Ford Protects Dealers—by instituting first "sale-or-return" policy in England. Scheme guarantees dealers against reduced taxes and other risks.

German Machinery Exports Drop—because of increased restrictions by United Kingdom, France, and British Commonwealth. Total during 1952 is estimated at 3.4 million marks, 20½% of all German exports. U S took only 3.6% of total machinery exports.

Reynolds Has Guiana Bauxite Plant — bought from a British Guiana subsidiary of American Cyanamid Co. Transfer of assets is OK'ed by government there. Alumina mined will go to Anaconda Copper Co under 29-year contract.

Lift Trucks Will be Made in Holland—by Hyster Co wholly-owned subsidiary to be established at Nijemgen, near German border.

Mexican Machine-Importers Meeting—quoted a recent yearly business of 1300 million pesos, and a total over six years of 400,000 tons of industrial equipment. The five-day meeting was attended by 400.

Japan Expands Shipping—to attain 1.2 million tons in four years. Most is commercial, but estimates on destroyers up to 2000 tons are being asked.

Hungary Boosts Iron-Curtain Machine-Tool Production

LONDON—More than 28 types of machine tools are now being built in Hungary. Not until after World War II did the Hungarians produce more than a few minor types, and most machine tools were imported, mainly from Germany.

The policy of rectifying the disparity between the more developed branches of industry and others which were badly neglected has resulted in a boost for machine-tool production. By the end of 1949, it was announced that 30 times more machine tools were produced than before the war. Although figures are not available, there are indications that production of these machines has increased considerably since then.

The types in production include various kinds of lathes, drillpresses, and milling machines, radial drills, column drills, vertical boring and turning mills, a ram-type cold saw, plate shears, bench drills, shapers, and spring hammers.

Lathes include a precision type of 7-in. center height, 39-in. centerdistance, known as the EV 195. The headstock and feedbox are made in self-contained units and can be fitted to other beds.

Toolroom Lathes

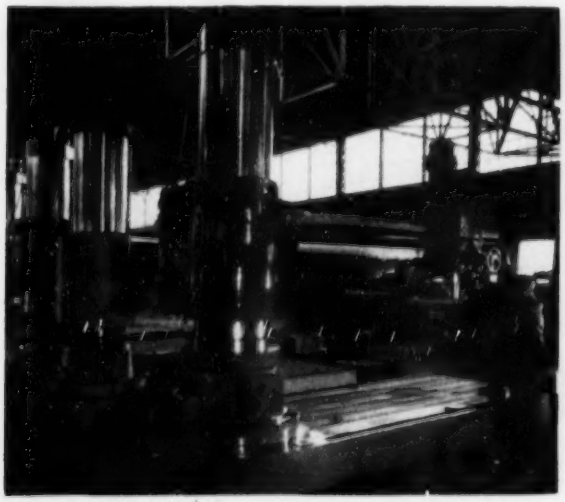
The ELN precision toolmaker's lathe, which has been exported to a number of countries, has 16 spindle speeds within a range of 65 to 2200 rpm. It has a fully-enclosed feed gearbox on which a variety of metric, Whitworth, and Module threads can be cut.

A toolroom lathe is also built, as well as four type of engine lathes, the largest of which is 10 ft between centers. Turret lathes are also being added to the range.

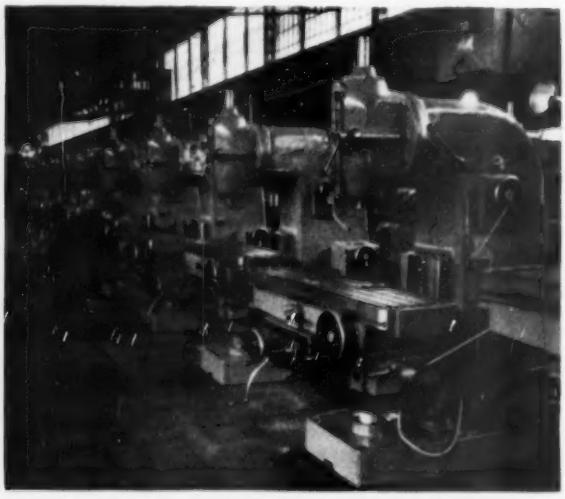
The large Matyas Rakosi plant in Budapest builds a double-column vertical turning and boring mill with a 51-in. table. The RF radial drills are made in various sizes and two different drilling capacities. The RF 2a and 2b drill up to 3/32 in. in solid steel; the 3a and 3b have a capacity of 2⅜ in. Drilling radii range from 56 in. for the 2a to 78 in. for the 3b model.

The spindle is driven by an electric motor flanged into the top of the head and operated through a change gear. This arrangement provides 18 spindle speeds on the larger model. The drive motor also actuates the feedbox, which allows eight other speeds to be selected by means of the feed lever on the head.

The VF22 vertical milling machine, an improvement on an earlier model, has a 59 × 15-in. table surface, a longitudinal movement of 32 in., and a cross motion of 11¾ in. Vertical traverse is 16½ in. There is also a series of universal milling ma-



RADIAL DRILLS MADE BY MATYAS RAKOSI, BUDAPEST, closely resemble standard models produced all over Europe



VERTICAL MILLS, TYPE VF22, ARE AN IMPROVEMENT on an earlier model. These are for export to Indonesia

chines, of which the most recent is the UF 22, which has spindle speeds up to 1500 rpm and a mono-lever operation for spindle speed, feed, and rapid traverse.

Two kinds of column drills are being produced. These are identical, except for circular table and baseplate working surfaces.

Other machines include a plate-cutting shear, WL 2500, with a cutting length of 98 in. It cuts mild-steel sheets up to 19/32 in. The DF-1 circular cold saw for foundry use is made by Dimvag engineering works with a blade 4 in. in dia. The PW 550 shaper is a powerful machine with a 22-in. stroke and eight ram speeds from 17 to 169 strokes per min.

Another new machine is the KF 250 hacksaw, which has a 3-hp motor and a capacity of 10 in. in dia. Other machine tools include bench drills, a slotter, three types of spring hammers, and four types of power presses.

A considerable part of Hungary's machine-tool production is being absorbed internally as new enterprises are built and existing plants are retooled. However, as Hungarian industry needs to import many of its raw materials from abroad, particularly from non-industrial countries, machine tools make up a part of the export program. Some tools have already been sold abroad, particularly in Argentina, India, Pakistan, and some Middle East countries from which Hungary obtains raw materials. Another market is found in the two less industrialized countries of Eastern Europe, Bulgaria and Rumania.

Capital Spending Enters '53 Without Hesitation

WASHINGTON — Capital outlays for 1952 will total about 2% over those of 1951, in spite of the steel strike. The rate of spending for capital equipment as we go into 1953 will be at an even higher rate. These are the estimates given by business to the Securities and Exchange Commission and the Department of Commerce in an industrial survey taken recently.

Total expected outlays for last year are expected to total up $26.9 billion. The first half of the year recorded an annual rate of spending at $27.4 billion. This dropped to a rate of $25.7 billion in the third quarter—because of the steel shutdown. The rebound in 1952's fourth quarter pushed the annual rate to $28.3 billion, which will round off the year at about the $26.9-billion figure.

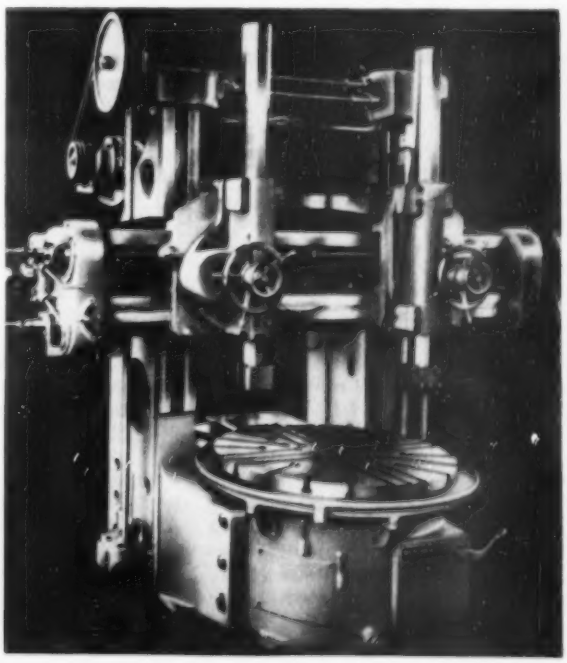
The rate going into 1953 will be a roaring $28.7 billion, according to early estimates. Transportation industries told the government agencies they would taper off in the first quarter of this year, but mining and manufacturing industries expected small gains. Public utilities expect a jump from $4.0 billion to $4.37 billion, the largest gain of any business group. Commercial and service industries also expect a healthy gain.

MIT Expands Executive-Training Program

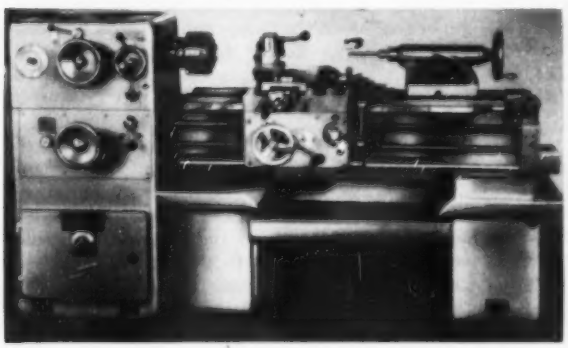
CAMBRIDGE, Mass—Plans for Massachusetts Institute of Technology's Executive Development Program for 1953-54 include expansion to increase the number of industrial candidates who can be included. The program operates under the Sloan Foundation, which provides financing. Two groups of 15 to 18 men, who must have five to ten years of industrial experience, part of it administrative, will be included in the program for the coming year.

Big Business Volume Predicted By Economists

NEW YORK — High-level activity will prevail in business during 1953, according to a group of distinguished economists who met recently under auspices of the National Industrial Conference Board. Government purchases of goods and services should be $5-$10 billion higher than the 1952 average. The economists felt that there will be a trend toward lower prices along with a rise of 2% in wages. Implication is that profit margins will be narrower.



HEADSTOCK AND FEEDBOX OF THE EV195 PRECISION LATHE (below) are self-contained units and can be fitted to various bed styles and sizes. The vertical boring and turning mill (right) has a 51-in. table and two individually controlled spindles



Richard F Thuma

Wilber F Koester

J S Roscoe

J V Naish

Names in the News

Richard F Thuma has been appointed superintendent of tools and maintenance at Allis-Chalmers' West Allis Wks, advancing from chief tool engineer and assistant superintendent of tools and maintenance. **Wilber F Koester** has been named manager of the plant-engineering dept, general machinery div, which is a new department with responsibility for plant engineering in the eight machinery-div plants of the company. Other Allis-Chalmers personnel changes include the advance of **John Semrad** to assistant superintendent of tools and maintenance at the West Allis plant, **Kenneth Schultz** to department superintendent of tool engineering, **Donald McHenry** to chief draftsman of tool engineering, **Gordon Niederer** to assistant chief draftsman, and **Elmer Ramthun,** who is now in charge of electrical tooling.

Wilbert G Prasse has been elected president of The Oilgear Co, succeeding the late **George H Fobian,** and advancing from general sales manager, and vice president and director. Mr. Prasse is a mechanical engineer, and worked at one time for the Falk Corp. He is succeeded as vice president and director of Oilgear by **Frank K Kuhagen,** a former sales and service representative and sales manager of the company.

J S Roscoe has been appointed executive vice president in charge of business administration for the Lincoln Electric Co, replacing **William Irrgang,** who is now executive vice president and is in charge of all manufacturing. Mr. Roscoe has been a district manager and director of purchasing of the company.

Arch A Warner has been appointed president and general manager of the Mechanics Universal Joint Div, Borg-Warner Corp. He moves from the same positions at the Rockford Clutch Div of the company, replacing **G C Gridley** who is retiring to an advisory capacity. **Harry L Emerson** will succeed Mr Warner as president and general manager of the Rockford Clutch Div, moving up from vice president in charge of manufacturing.

H Earle Runion has been appointed production manager of Consolidated Engineering Corp, in charge of setting up production schedules. He moves from his own engineering-consulting firm.

George B Howell has been named manager of manufacturing for General Electric Co's welding dep't, succeeding **Thomas Sproule** who has joined the manufacturing-services div of GE.

William S Richardson, vice president of B F Goodrich Co, has been elected an executive vice president, a director of the company, and a member of the executive committee of the board. He has been general manager of the industrial and general-products-sales div, and is president of B F Goodrich Chemical Co in addition.

Harry C Davis, general manager of Kanawha Manufacturing Co, has been elected president of the Conveyor Equipment Manufacturers Assn, succeeding **G Walter Ostrand. R C Sollenberger,** staff head of the organization, was reelected executive vice president of the association.

J V Naish has been elected executive vice president of Consolidated Vultee Aircraft Corp, moving up from vice president for sales and contracts. Mr Naish has an outstanding record in the aviation industry. He folded up his investment business eleven years ago and started in at Northrup Aircraft, Inc, as a semi-skilled mechanic, moving up from that job to purchasing agent, manager of subcontracts, director of material, and factory manager. Another announcement by Convair is that **J G Zevley** will assume Mr Naish's duties, moving from manager of contracts for Convair's San Diego Div.

Richard F V Stanton has been elected president of Whitney Chain Co, replacing **W H Whitney,** who continues as chairman of the board. Mr Stanton is also general manager of the firm, and will act as chief executive officer of Whitney Chain and Hanson-Whitney divisions. He has resigned his position as vice president in charge of manufacturing at American Machine & Foundry Co.

C W Heppenstall has been appointed manager of forging operations at Air Force's heavy-press plant for aluminum forgings at Newark, O, which will be operated by Kaiser Aluminum & Chemical Corp. He is former vice president of operations and director of Heppenstall Co.

J R Weaver has been named manager of manufacturing and engineering for the Springfield, Mass, plant of Westinghouse Electric Appliance Div, where he succeeds **C B Dick. P Y Danley** has been named commercial manager of the plant's products and will be responsible for defense products.

Warren G Rosendahl

John S Roller

John E G Kline

Douglas T Peden

Warren G Rosendahl has been appointed director of manufacturing for Columbia Machinery & Engineering Corp, moving from a position of assistant general manager, Hamilton Div, Clearing Machine Corp. He will report to the president of the company, and will be responsible for coordinating manufacturing operations on new products.

Harlow H Curtice has been appointed acting president of General Motors Corp, taking over in place of **Charles E Wilson,** who will be Secretary of State in the new Washington administration. Mr Curtice has been executive vice president of the corporation.

John K Northrup, president of Northrup Aircraft, Inc, has retired from the aeronautical field. He will be replaced by **Oliver P Echols,** former chairman of the board of directors of the company, and by **Edgar Schmued,** who will take over Mr Northrup's engineering duties by acting as vice president in charge of engineering. Mr Northrup, a founder of the company, is a pioneer in the aviation field, and was formerly associated with Lockheed Aircraft Corp and Douglas Aicraft Co. His work included designing on experimental flying-wing aircraft and on the P-61 Black Widow night fighter. His retirement is due to ill health.

Roger E Gay, president of Bristol Brass Corp, and **Edward T Gushee,** vice president of Detroit Edison Co, have been reelected president and vice president, respectively, of American Standards Association at the annual meeting in New York City. New directors are: **J L Cranwell,** vice president, Pennsylvania Railroad Co; **Dr W R G Baker,** vice president, Electronics Div, General Electric Co; and **George A Delaney,** chief engineer, Pontiac Motor Div, General Motors Corp. Reelected directors are: Mr Gay; Mr Gushee; **J H McElhinney,** vice president, Wheeling Steel Corp; **R M Gates,** president, Air Preheater Corp; and **R Oakley Kennedy,** member-at-large.

Wylie Brown has been elected a director and chairman of the board of Hydropress, Inc. He has retired as chairman of the board of Phelps Dodge Copper Prod Corp, a company he has headed for many years.

Helmut Shelp has been appointed by AiResearch Mfg Co, a division of Garrett Corp, to investigate new products and new applications. He has just recently finished establishing a special-products engineering group for the firm. **W T von der Nuell,** former senior project engineer in turbo machinery, has been appointed senior project engineer for the company.

John S Roller has been appointed assistant general sales manager of Firth-Sterling, Inc, moving up from the position of vice president and general manager of Method X Co, a Firth-Sterling affiliate. He was at one time general manager of sales for Republic Supply Co, and has a background with Republic Steel Co.

John E G Kline has been elevated to vice president in charge of process development and patents, and **Douglas T Peden** has been promoted to vice president in charge of research and experiments both for Micromatic Hone Corp. Mr Kline came to Micromatic when Hutto Engineering Co was absorbed, and has been chief engineer and executive of Micromatic. Mr Peden has worked in machine-tool design and development with the company.

Charles R Crowder, executive vice president and a director of Van Norman Co, has been elected to the board of directors of H K Porter Co.

(Continued on p 220)

OBITUARIES

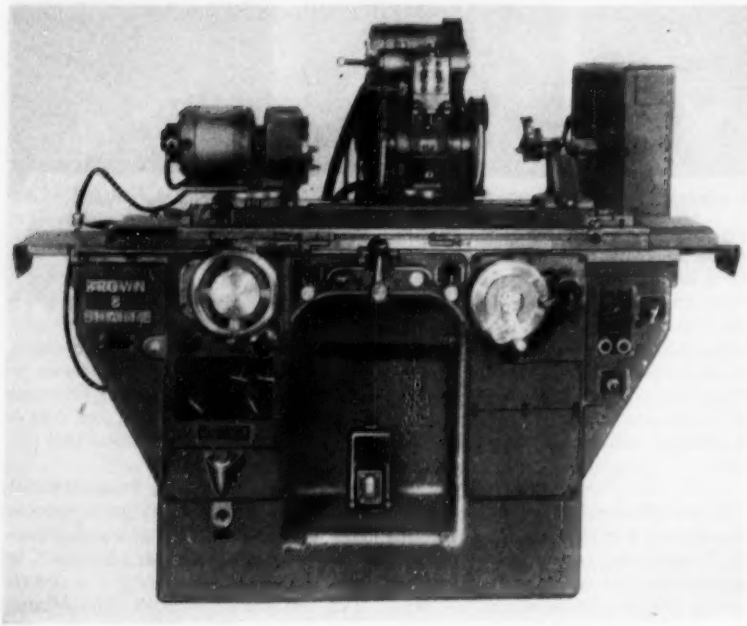
Clifton G Bigwood, vice president in charge of operations and director of L S Starrett Co, died on Dec 8 after 36 years of service with the company. He started in the toolroom and machine shop, became methods engineer, then assistant superintendent. He was a member of ASTE.

Jervis B Webb, pioneer conveyor specialist and president of his own firm of mechanical engineers, died Dec 31. He was founder and president of the Huron Forge & Machine Co, a member of ASE, and belonged to the Engineering Society of Detroit.

Kendall B Rowell, chief engineer of American Locomotive Co, died on Dec 12. He was responsible for product development and engineering, belonged to ASTE, and was a professional engineer registered in New York State. He was appointed chief engineer of Alco on last November 5.

Robert G Geiger, stamping executive with Canton Stamping & Enameling Co and later with Republic Stamping & Enameling Co, died Dec 12. For the last five years he was working in the sales department of Republic Stamping.

New Shop Equipment



Brown & Sharpe Universal Grinders Provide Increased Flexibility

	No. 1	No. 2	No. 3	No. 4
Swing over table, in.	10	14	14	14
Distance between centers, in.	22¾	33¾	43¾	63¾
External wheel speed, rpm	2500	1600	1600	1600
	3000	2000	2000	2000
	3600	2400	2400	2400
Internal wheel speed, rpm	24,000	16,500	16,500	16,500
Headstock speed, rpm	60 to 600	25 to 500	25 to 500	25 to 500
Table power travel ipm	3 to 150	3 to 150	3 to 150	3 to 150

The line of four universal grinders produced by Brown & Sharpe has been redesigned for greater flexibility. The wheel spindle unit has universal mounting. Both external and internal spindles can be used in any desired horizontal position or in compound settings for combination straight and taper or double taper grinding.

Internal grinding spindle is hinge mounted at the front of the wheel spindle unit where it can be moved into operating position and clamped. In addition to standard units, speeds of 16,500 and 35,000 rpm are obtainable in No. 1, and 12,500, 24,000, and 35,000 rpm for the other three sizes.

Fine cross feed is adjustable to 0.0001 in. on work dia for accurate sizing. Positive stops are provided on cross feed for either external or internal grinding.

The grinders conform to JIC electrical and hydraulic standards.

Brown & Sharpe Manufacturing Co, Providence 1, RI

Steel Descaler

Enthone Descaler 2A, for rapid removal of oxide and scale from steel, is available in dry powder form. Can be used in concentrations ranging from one to several lb per gal., with temp from 70 to 180 F, depending upon speed of descaling desired.

Controlled acidity permits uniform pickling with a minimum of attack on the base metal; surface is left cleaner and brighter than when acids are used.

Can be used for tumble or barrel derusting or descaling, as well as in vats or tanks, and for primary pickling or plating cycles. Surfactants dislodge oil films, and produce clean, white surfaces. Available in 100- and 400-lb containers.

Enthone, Inc, Dept AM, 442 Elm St, New Haven, Conn

Ex-Cell-O Precision Tool Grinder Sharpens ⅝-in. Square Tools

Style 44-A, precision tool grinder uses 6-in. cup wheels. Especially suitable for diamond wheels, it sharpens boring, turning, and facing tools up to ⅝-in. square or equal cross-sectional area.

U-shaped tool rest tables can be tilted to the angle required—shown on a scale in degrees. Coolant tank is located in the base with a large clean-out and drain opening positioned for easy maintenance.

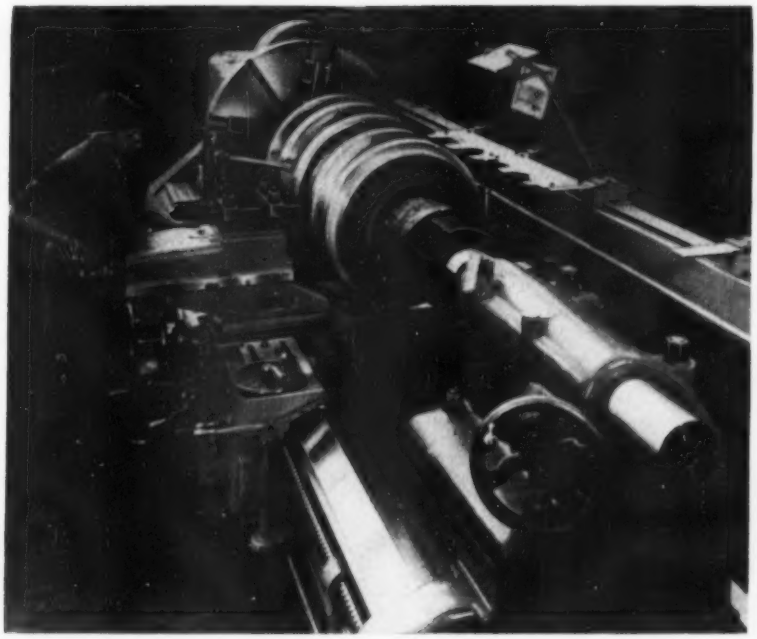
A-grinder is a double-end model with reversible motor to grind left- and right-hand tools on the same wheel.

Ex-Cell-O Corp, 1200 Oakman Blvd, Detroit 32, Mich

Broached-surface bushing has a series of minute cutting edges on the outside which cut their way into position with uniformly accurate results. Once installed, the bushing is firmly locked in position. Greater variations in the size of the locating hole are allowable. Units will work satisfactorily with a tolerance of 0.002 of an inch.

Aeroquip Corp, Jackson, Mich

Materials and Parts



LeBlond 40-in. Roll Contouring Lathe Demonstrated at Plant Jan 26-30

Two-directional hydraulic tracing makes possible the turning of steep-angle contours in the LeBlond 40-in. roll contouring lathe. Two hydraulic motors are automatically controlled through a single valve as the tracing stylus follows the contours of a flat templet mounted at the back of the lathe.

One motor is mounted at the back of the carriage and drives the cross-feed screw, the other powers the feed to the carriage. Mechanical power rapid traverse to the carriage and cross-slide in both directions is built in the apron. Hydraulic rapid traverse can be used to retract the cross-slide when under tracer control.

Hydraulic controls, mechanical power rapid traverse, speed rate, feed rate, and spindle controls and located at the apron. It is claimed that feed and speed can be varied during a cut without interrupting the finish.

Cross feed can be bypassed and length feed used separately—useful in roughing. Standard feeds and threads are available through the quick change box with safety interlock to prevent tracer motors from operating.

Nine speed changes in the headstock deliver 1 to 165 rpm from the 40-hp dc motor. Swing over the cross-slide is 28 in.

The lathe will be demonstrated at the plant January 26 to 30. Persons interested in attending are requested to write LeBlond indicating the day they will attend.

The R K LeBlond Machine Tool Co, Cincinnati 8, Ohio

Panalarm 50, a plug-in annunciator system incorporates complete interchangeability of circuits and functions. Single, hermetically sealed unit can be used to signal any off-normal condition throughout the plant, providing both an audible and visual alert. Standard stock systems are available, providing for 3 to 54 individual signals operating with horn and acknowledgment button.

Panalarm Products, 6312 North Broadway, Chicago 40, Ill

... INCLUDING

Gear finisher for internal gears provides choice of two shaving methods page 168

Cylindrical grinders for plunge cut and traverse operations that require wide wheels page 170

Bandsaw twists blade 90° to feed work from front of machine page 172

Portable drill attachment guides drill perpendicular to work page 172

Plate and angle punch with 250-ton capacity has 2½-in. stroke page 176

Powder-cutting equipment for stainless steel can be mounted on a two-wheel gas-cylinder truck page 180

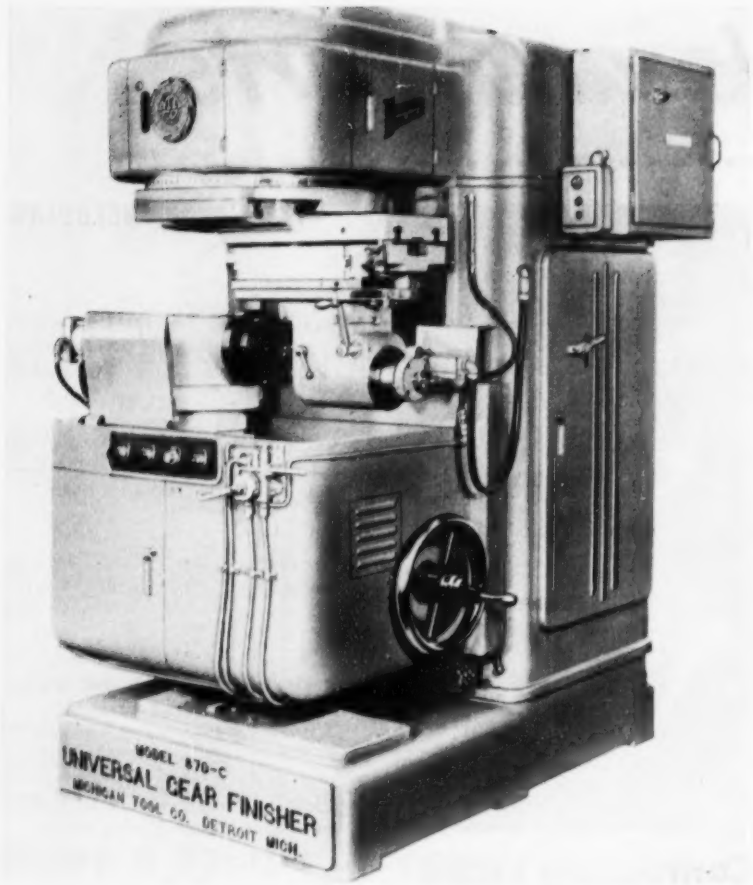
Plastic molding press, 30-ton capacity, has air-operated pushback cylinders page 182

Adhesive tape pre-printed with symbols, scaled ¼ in. to 1 ft, for plant-layout planning page 184

...and in Jan. 19

1953 PRODUCTION PREVIEW

The 40th Annual Review of new equipment, materials, and parts described in these pages during the preceding year, condensed and classified for your convenient reference in production planning during the year ahead.



Michigan Tool Internal Gear Finisher Provides Two Shaving Methods

Cutter pitch dia	3 to 6 in.
Max stroke	5 in.
Max gear width	4¾ in.
Coarsest diametral pitch	5
Work dia	4 to 12 in.

Model 870-C internal gear finisher for spur and helical internal gears up to 12-in. OD will handle gears as small as 4-in. pitch dia. Smaller sizes can be accommodated with a special cutter spindle.

Transverse (reciprocating) shaving method employs a relatively low-cost serrated-tooth cutter. Cutter is reciprocated across the face width of the internal gear in a crossed axis arrangement while it is driven by the work. Automatic up-feed mechanism provides one or two finishing passes to bring the gear to size.

Optional plunge-feed mechanism is faster than conventional shaving, with a serrated-tooth shaving cutter wider than the work. Work is rotated, driving the cutter, and no reciprocation occurs.

Adjustments for spindle speed, reciprocating action, cycle time, loading and unloading are provided. Operating cycle is automatic and electrically controlled with four motors. Width, 45⅝ in.; depth, 62¼ in.; height, 84⅛ in.; weight, 11,000 lb.

Michigan Tool Co, 7171 E McNichols Rd, Detroit 12, Mich

Hy-Tin paste, containing powdered solder suspended in flux, cleans and tins cast iron, stainless steel, monel, cast steel, copper, brass, galvanized and lead-coated steel. Flux is non-active at normal temp; at soldering temp it turns liquid and removes scale and tin black iron. Applied with steel wool, damp cloth, or brush. A 1½-lb can will tin 40 sq ft.

Farrelloy Co, 1217 N 26th St, Philadelphia 21, Pa

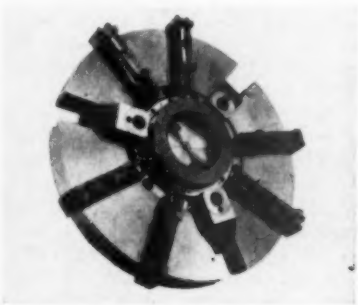
A new pressure-measuring instrument called Press-I-Cell measures pressure with an accuracy of one part in 5000, and has a sensitivity of one part in 15,000. Portable, 5-in. dia, 14-in. length instrument is temp-stable, and unaffected by vibration or mounting position. It can be equipped to operate over a wide range of absolute or gage pressures or differentials; manual or automatic models available. Applications include: a master laboratory instrument for calibrating other pressure-sensing instruments; precision measurement of altitude or barometric pressure; liquid level gage for large storage tanks.

Fischer & Porter Co, Hatboro, Pa

Zinc Die-Casting Machine

This 1½-lb zinc machine has an electronically-controlled panel, 10x10x 2½-in. die blocks, 4 tie bars, semi-automatic cycling with adjustable timing dwell on opening and closing of the toggle. Air-operated unit is capable of a free cycling speed in excess of 1000 shots per hour.

A B C Die Casting Machine Co, 339-41 W 112th Place, Chicago 28 Ill



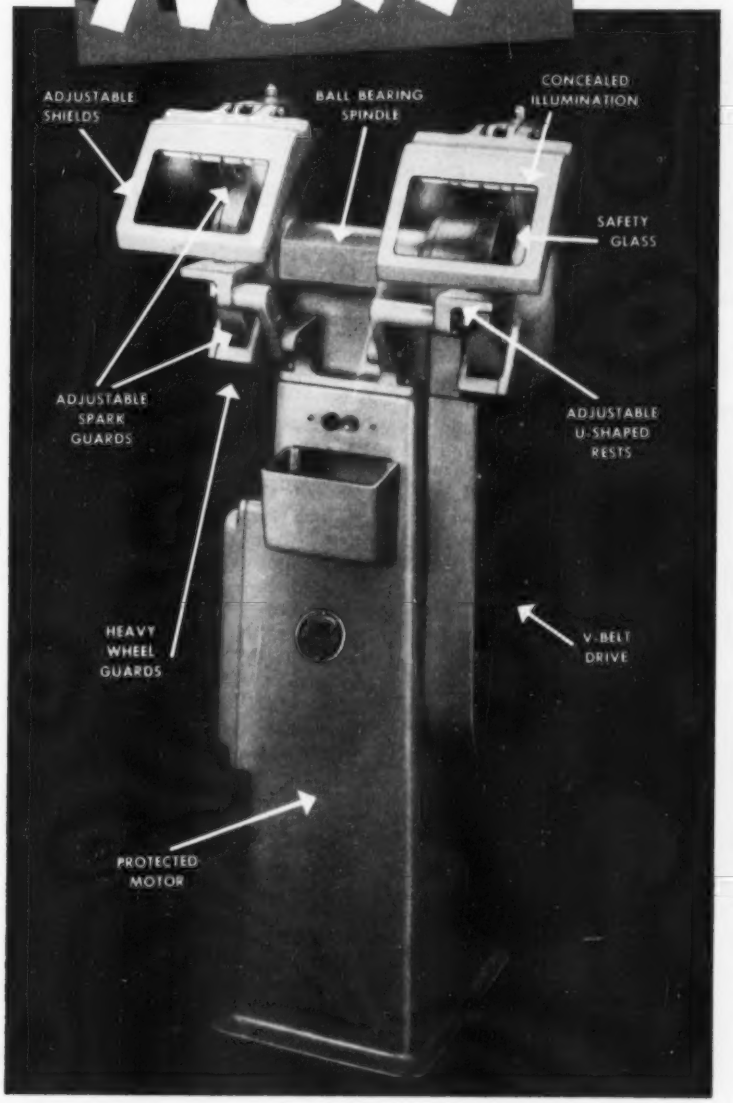
Chuck for Large Pieces

This chuck rigidly holds large workpieces of small cross-section without the usual distortion strain or harmonic vibrations encountered when machined at high speeds.

Can be furnished for manual chucking or air power chucking for repetitive machining operation.

Cushman Chuck Co, Hartford 2, Conn

New SOUTH BEND Pedestal GRINDER



You will find this new grinder ideal for precision tool grinding. It is ruggedly built throughout to withstand hard service. The motor is enclosed in the pedestal and drives through a V-belt which removes the load and weight of the grinding wheels from the motor bearings, practically eliminates vibration and isolates the motor from abrasive dust.

Send coupon for complete information on this grinder that will give you long, trouble-free service.

SPECIFICATIONS

Wheel Size: 8" dia. (½ h.p. motor), 10" dia. (¾ h.p. motor).

Spindle: Approximate speed 2450 r.p.m. Sealed ball bearings.

Motor: Standard 2875 r.p.m. 50 cycle or 3450 r.p.m. 60 cycle, also D.C.

Over-all Dimensions: 8" Grinder, 49½" high, 18" wide, 20½" deep. 10" Grinder, 49½" high, 18½" wide, 20½" deep.

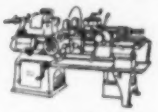
SEND INFORMATION CHECKED:

☐ SOUTH BEND GRINDER

☐ TOOLS & ATTACHMENTS

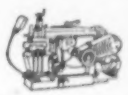
☐ 9" and 10" BENCH LATHES

☐ 10" to 16-24" FLOOR LATHES



☐ ½" and 1" Collet TURRET LATHES

☐ 14" DRILL PRESSES

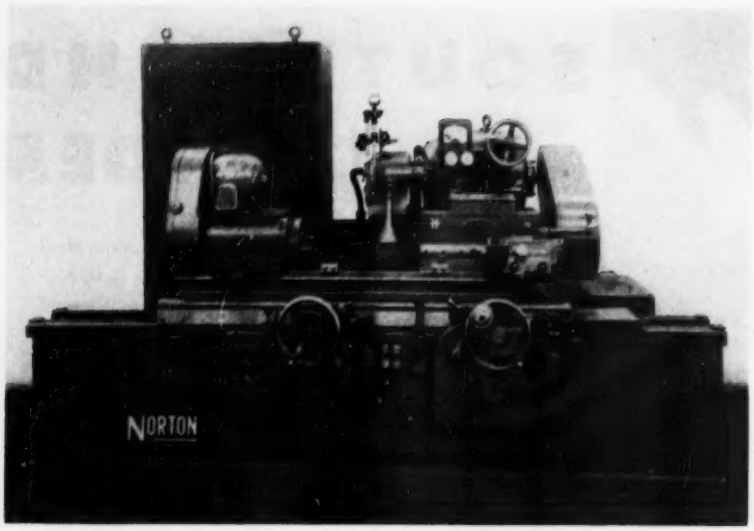


☐ 7" BENCH SHAPERS

Name_____ Company_____

Street_____ City & State_____

Building Better Tools Since 1906 • **SOUTH BEND LATHE** • South Bend 22, Indiana



Norton Cylindrical Grinder Made In Plain or Semi-Automatic Models

The 10-in. type CTU-HD (shown above) and 14-in. LCTU-HD heavy-duty grinders are made in 18, 36, 48, or 72-in. lengths. They are for plunge-cut and traverse grinding operations that require larger diameter or wider grinding wheels than conventional type CTU Norton grinders.

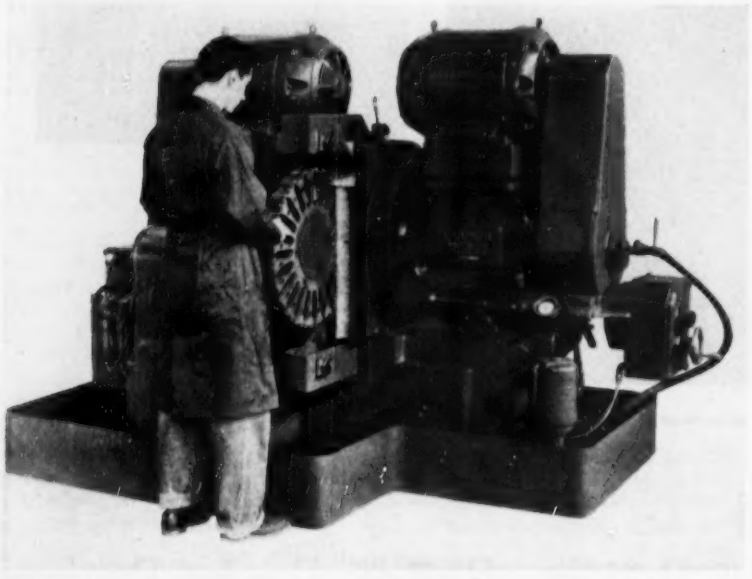
Wheels up to 10 in. wide can be mounted in the heavy-duty head. Wheel feed is by a revolving feed screw mechanism with click-count index for settings to 0.0001-in. dia reduction.

Preset trueing and grinding table speed arrangement permits presetting of these speeds and immediate selection thereafter of one or the other by a combination table start-stop and selector lever.

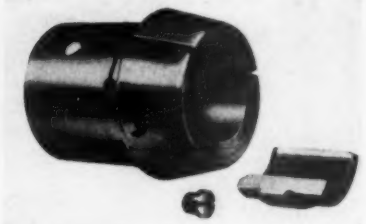
Operation is further simplified by automatic control of work rotation and coolant flow. Automatic adjustable wheel feed at table reversals with automatic resetting of the wheel head and separate dwell controls for each end of table travel are also furnished.

Pumps, motors, filters, valves are mounted on the outside of the machine to simplify maintenance. Electrical controls are grouped in an elevated enclosure. The semi-automatic machine provides an automatic grinding cycle.

Norton Co, Worcester 6, Mass



TURBINE BLADE GRINDER — No. 125-26-in. double spindle grinder rough grinds the parallel ends of turbine blades prior to hardness testing. Rotary attachment carries a work-carrier with approximately 26 slots into which turbine blades are manually loaded. A chain hold-down attachment holds work during grinding. They unload automatically. Production is 20 to 25 pieces per min. — *Gardner Machine Co, Beloit, Wis*



Collet Pads

Universal No. 3 collet pads have been designed for use with the Hall Model B 2-in. collet chucks.

Sizes range from 3/16 in. to 1 17/32 in., by 32nds; hexagons from 3/16 in. to 1 in. by 16ths; square from 3/16 in. to ½ in. by 16ths.

Lathe does not need to be stopped to reset work; chuck can be opened and closed easily while running under full speed.

Hall Manufacturing Co, 622 Tularosa Drive, Los Angeles 26, Calif

Single Disk Clutch

Single disk clutch, specifically designed for light machinery service up to 6 hp, incorporates a floating disk which rides free in neutral, preventing drag, abrasion, and heating. Hex-key frees the knurled ring for easy manual clutch adjustment.

No. 350 is for a 3-hp unit, and No. 450 for 6 hp.

Carlyle Johnson Machine Co, Manchester, Conn

Do Dimensions over 10" give you trouble?

- No workpiece too large, infinite range.
- ID, OD or linear dimension inspected accurate to .000005".
- Patented clamps, jaws, center point, scriber and base offer wide gaging applications.
- Write for full description of HD Gage, Blocks and Fixtures.

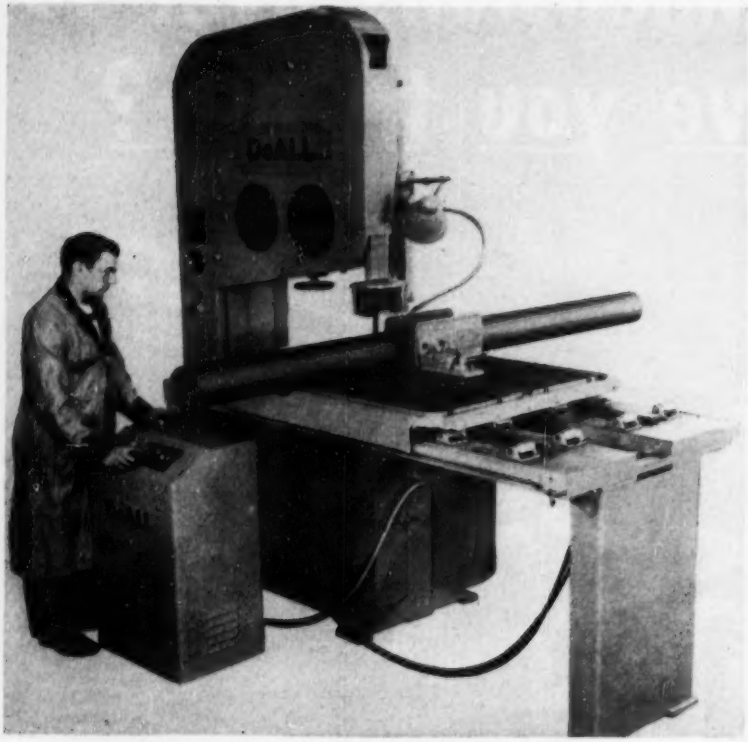
Webber

HEAVY DUTY GAGE BLOCKS AND FIXTURES

TEMP-CHECK

No need to wait for work to "cool off" before making critical inspection . . . tells temperature quickly. Write for literature.

WEBBER GAGE COMPANY
12901 Triskett Road, Cleveland 11, Ohio



DoAll Bandsaw for Heavy Work Twists Blade 90 Deg.

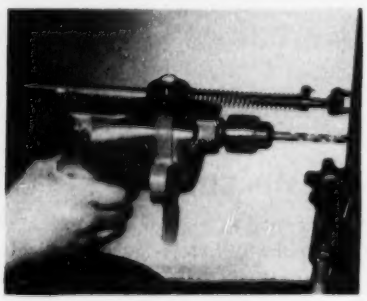
The Zephyr Model CO-36 differs from conventional bandsaws in having the saw blade twisted 90° at the worktable so that work is fed to the blade from the front. Thus length of stock that can be cut off is not limited by the throat capacity.

Work can be accommodated that is 15½ in. thick under the saw guides and 9½ in. thick at the column. The 40x48-in. worktable is hydraulically powered and can handle work up to 2000 lb.

A 3-speed transmission and 10-hp variable speed drive gives speeds from 40 to 10,000 fpm.

The saw can be converted to conventional high or low speed, straight or contour sawing by changing the saw guards to eliminate the twist from the blade.

The DoAll Co, 254 N Laurel Ave, Des Plaines, Ill



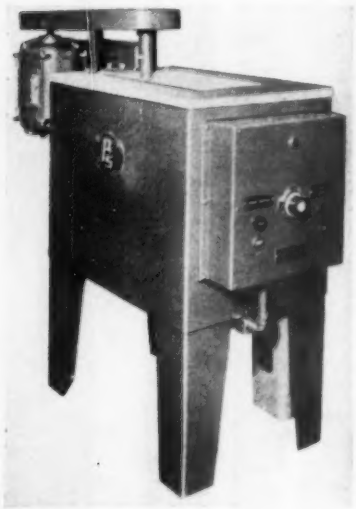
Attachment Guides Drill Vertically and Horizontally

Guide-a-Drill is a portable drill attachment easily and quickly saddled on electric or pneumatic drill housing with a leather strap and buckle. Circular level is clearly visible and shows the operator exact vertical position of the drill; contact head, which is calibrated in 5° divisions, is also clearly visible, and shows the exact horizontal position of the drill in relation to the work. Drilling or reaming a distorted hole is thereby eliminated, as well as a two-man set-up. Unit is priced at $12.50.

The Roy Silver Corp, 561 Bridgeport Ave, Devon, Conn

Greibach meters have a new meter movement in the from of a removable and replaceable cartridge; its movable coil, suspended on twin wires, is extremely sensitive to current variations in the absence of any frictional losses. Meters are available in sensitivity of 1 ma full-scale, and up; accuracy is maintained at ½%. Units are of the dc type, but can be applied to ac measurements in conjunction with suitable rectifying means. It can be used directly for checking and measuring transistor circuit values, as well as in vacuum-tube circuits, where currently only a vacuum tube voltmeter can serve.

Columbus Products Corp, 1010 Saw Mill River Road, Yonkers, NY



Line of Dipping Tanks For Protective Coatings

A 5-model line of production dipping tanks for Plastic Seal hot dip protective coatings is available, ranging from 8x4x6 in. up to 13x6x18 in.

Because of positive agitation created by the impeller-type agitator, and special heating elements which radiate heat to the sides of tank, an oil jacket is unnecessary, allowing more rapid heating and cooling. Positive agitation also eliminates surface congealing, maintains transparency and color over longer periods, and gives a constant level in the dipping area for mechanical conveyor dipping operations. Overload switch automatically shuts off impeller when necessary.

Plastic heat is controlled manually by a thermostat. New design reduces normal 6- to 8-hr melting time down to less than 2 hr on a 44-lb capacity tank. Units are available in a range of capacities from 6 to 1225 lb of plastic per load, and can process 2500 lb per 8-hr shift.

Globe Imperial Corp, 2023 Kishwaukee St, Rockford, Ill

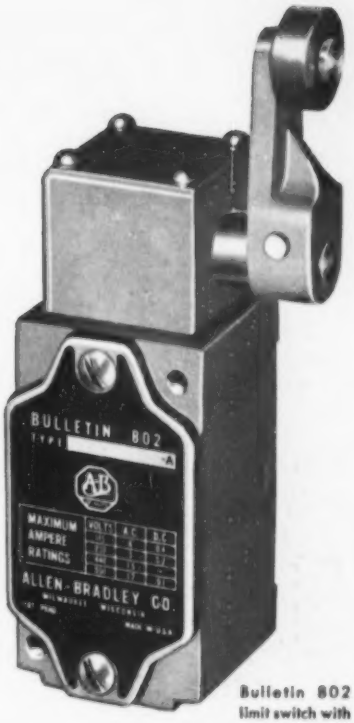
New OILTIGHT LIMIT SWITCHES

Here is a new line of remarkably compact Allen-Bradley limit switches . . . streamlined for fine appearance and built for millions of failure-free operations.

The operating heads of these limit switches may be attached to the switch body in four definite locations, each 90 degrees apart. A large selection of pushrods, lever arms, and other actuating mechanisms is available.

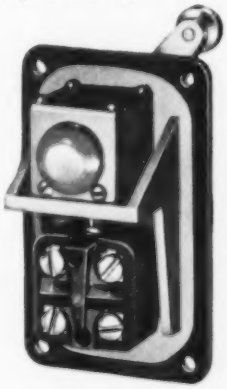
The name plate cover has a synthetic rubber gasket to exclude oil. Terminals are easily accessible by removing the cover plate. The body is threaded for ½" conduit. The switch mechanism is snap-acting, with one single pole normally open and one single pole normally closed contact, electrically separated.

The new Bulletin 802 limit switches are designed for machine tool applications. For further information send for a copy of Allen-Bradley Bulletin 802.



Bulletin 802 limit switch with roller lever

Roller lever type (Front View) for cavity mounting in machine frames



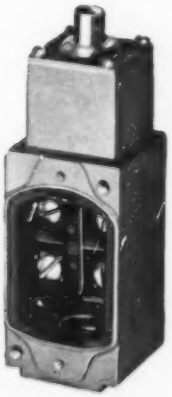
Roller lever type (Rear View) showing terminals for n.o. & n.c. contacts

ALLEN-BRADLEY
QUALITY
LIMIT SWITCHES

A-B Quality

Allen-Bradley Co.
1316 S. Second St., Milwaukee 4, Wisconsin

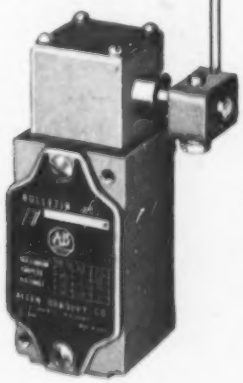
Pushrod limit switch with roller for vertical motion of the pushrod



Pushrod limit switch without roller—cover off to show terminals

Pushrod limit switch designed for horizontal motion of the pushrod

Pushrod limit switch with side pushrod and maintained contacts

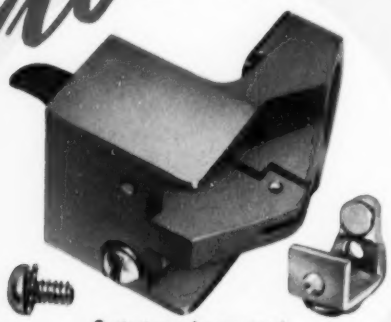


Lever operated limit switch with a long and flexible operating rod

1-53-MR

Extra! Handy Auxiliary Contacts

for all Allen-Bradley Sizes 0 and 1 Solenoid Controls



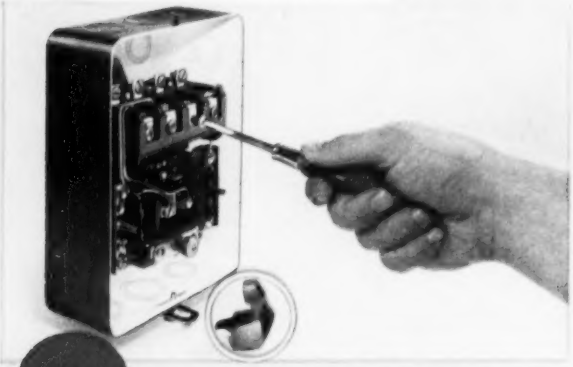
Contact may be reversed by removing one screw

Do you want to add one or more extra pilot contacts to some of your Allen-Bradley solenoid switches . . . to operate indicator lights, relays, or other starters?

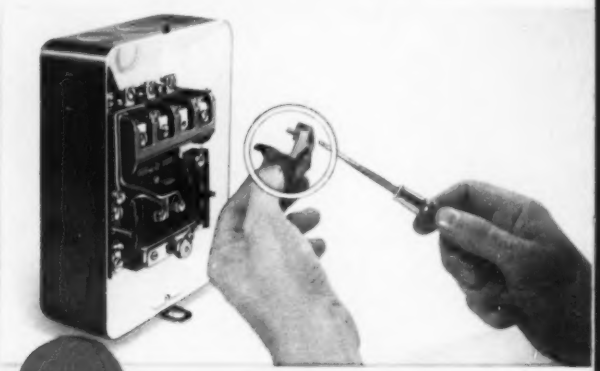
These new, compact auxiliary contacts can now be added to the arc hood of any and all standard sizes 0 and 1 solenoid switches. The operating arm of the auxiliary contact is actuated by the up and down motion of the solenoid plunger of the switch to which it is attached.

Write for descriptive literature.

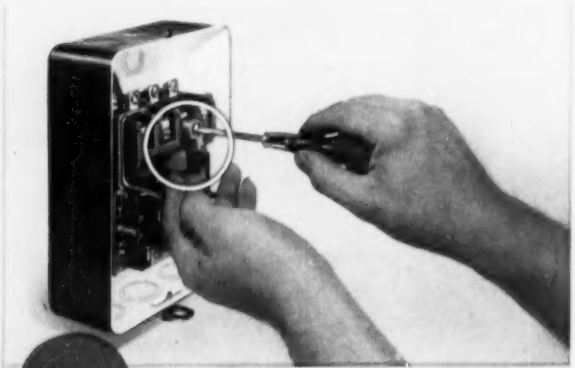
SO SIMPLY APPLIED



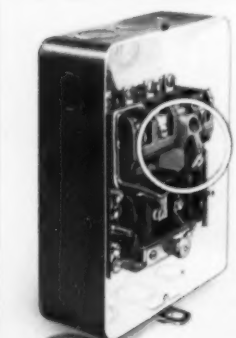
First Remove the terminal screw from the stationary contact block of the Allen-Bradley starter.



Second Insert terminal screw into mounting hole of auxiliary contact to be attached to starter.



Then Screw terminal screw into stationary contact block and fasten auxiliary contact to starter.



Ready to Wire Allen-Bradley auxiliary contact is now ready to be wired for any auxiliary pilot circuit.

Auxiliary Contacts easily changed from n.o. to n.c. operation

The new Allen-Bradley auxiliary contact may be instantly changed from n.o. to n.c. contacts. Removal of one screw permits the instant reversal of the contacts in the contact block. There are no small parts to lose.

1-53-MR

These auxiliary contacts are available for all Allen-Bradley sizes 0 and 1 controls, including contactors, reversing switches, combination starters, Bulletin 709 solenoid starters, and Bulletin 609 manual starters.

Allen-Bradley Co., 1316 S. Second St.
Milwaukee 4, Wisconsin

ALLEN-BRADLEY

SOLENOID CONTROLS

FEATURING

Versatility and Quick Change-Over

ON A WIDE RANGE OF WORK...

DEFIANCE
AUTOMATIC
SCREW CO.
Defiance, Ohio

GREENLEE *Automatics*

When our reporter visited the busy shop shown above, he found that the battery of four GREENLEES was used mostly in making parts for ~~DAS~~ Unions — a specialty product of the concern. These unions are low-cost pipe fittings, featuring a pressed-insert bronze seat, that will hold pressures up to 300 psi for steam and 750 psi for water. (This high capacity permits distributors to minimize their number of items for a wide range of requirements.) The concern also does a great deal of jobbing work, much of which is now "classified". Owners and operators alike expressed their satisfaction with GREENLEE machines and service, also indicating the GREENLEES are "easier to work on". With their quick change-over features, the GREENLEES are an important factor in holding down costs on the component parts required for the ~~DAS~~ Union line.

Production-line tooling data for the seat end of a ¾" ~~DAS~~ Union, as run on a 1⅝" Greenlee Six-Spindle Automatic, is as follows:

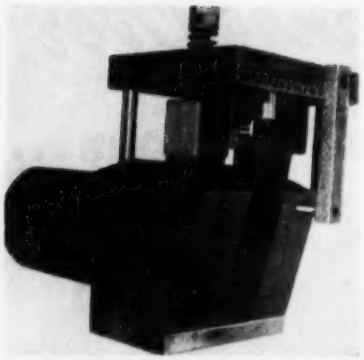
Position	Cross Slides	Main Tool Slide
1	Rough Form	Form Drill 1 $^{1}/_{16}$" dia.
2	Finish Form	Drill ⅞" dia.
3	Knurl	Form Ream
4	———	Thread 1¼" OD
5	Break down part way for cut-off	Tap ¾" pipe thread
6	Cut off	———
Cycle Time — 14 sec.		Production — 257 pcs. per hr.

PRODUCTION MACHINERY
GREENLEE

GREENLEE BROS. & CO.

1721 MASON AVE., ROCKFORD, ILLINOIS

MULTIPLE-SPINDLE DRILLING, BORING, TAPPING MACHINES • AUTOMATIC SCREW MACHINES • AUTOMATIC TRANSFER PROCESSING MACHINES



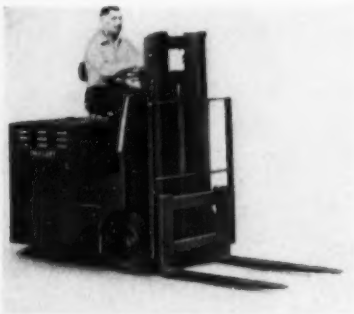
Toolbit Setter Reduces Replacement Time to Minutes

The Micro Pin tool setter has been developed to reduce the time necessary for replacing or resetting one or more toolbits. Workpieces and toolholder need not be removed from the machine while operating the device.

Tool setter is placed on the holder and held there by a permanent magnet, eliminating clamping distortion. Three point-positioning legs allow for any irregularities in the holder.

Gage pins are brought into contact with cutting edges of the toolbits; pins are then locked with set screws, and setter is removed with the exact tool position locked to the pins. It is then placed on a surface grinder, and back ends of the pins are ground flush with the face. Set screws are backed off and pins allowed to float, providing permanent and accurate means of measuring the tool location.

Arnold C Gayne Associates, Inc, 670 State St, Bridgeport, Conn



Short Turning Fork Truck

New 3000-lb capacity fork truck with a 24-in. load center has a short turning radius which permits right-angle stacking in a 10-ft aisle with a 48-in.-long load.

Model A-3444 is equipped with a double reduction unit drive assembly, compensating controlled caster steering axle, automotive wheel steering control, and the Mercury hydraulic hoist system with balanced cross suspension of load.

Mercury Mfg Co, 4044 South Halsted St, Chicago 9, Ill

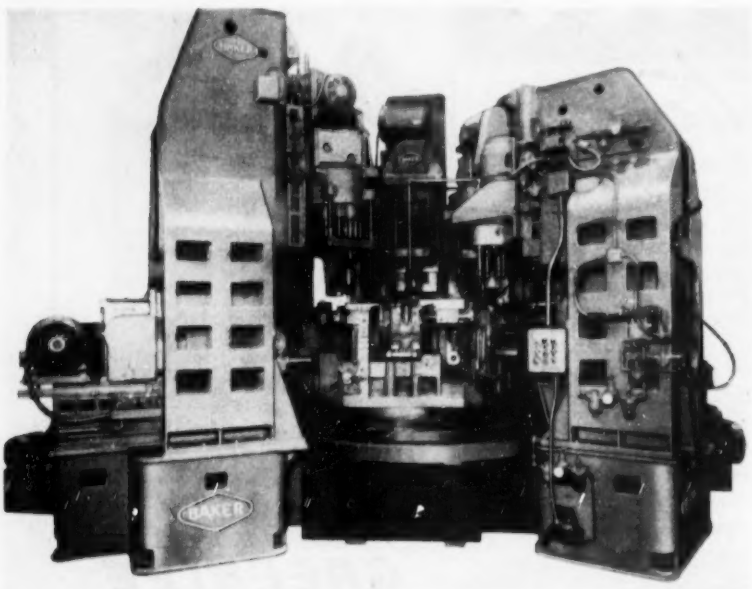
Photoelectric Counter Set

Photoswitch counter set PIC consists of a photoelectric control, light source, and electric counter; only equipment located at the point-of-count is the control and light source.

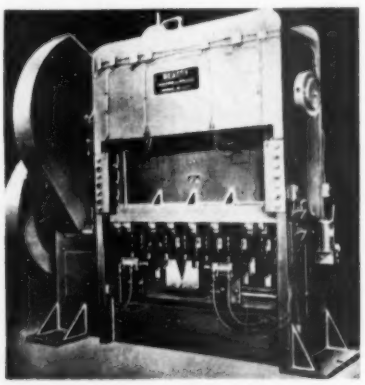
One or more electric counters, containing counter face and reset knob, may be placed at any convenient location and wired to the control, permitting remote counting.

Completely packaged unit has a line cord with a male plug connection for any standard 115-v ac outlet. Speed of operation is 600 counts per minute; operating range: 6 ft between photoelectric control and light source.

Photoswitch, Inc, 77 Broadway, Cambridge 42, Mass



MULTI-OPERATION MACHINE utilizing standard Baker 7½x16 and 15x16 units, and a 72-in. six-station power indexing table, performs drilling, chamfering, boring, counterboring, and tapping on clutch housings at the rate of 80 parts per hr. Units are mounted in horizontal, vertical, and angular planes. — *Baker Brothers, Inc, 1000 Post St, Toledo, Ohio*



250-Ton Plate and Angle Punch

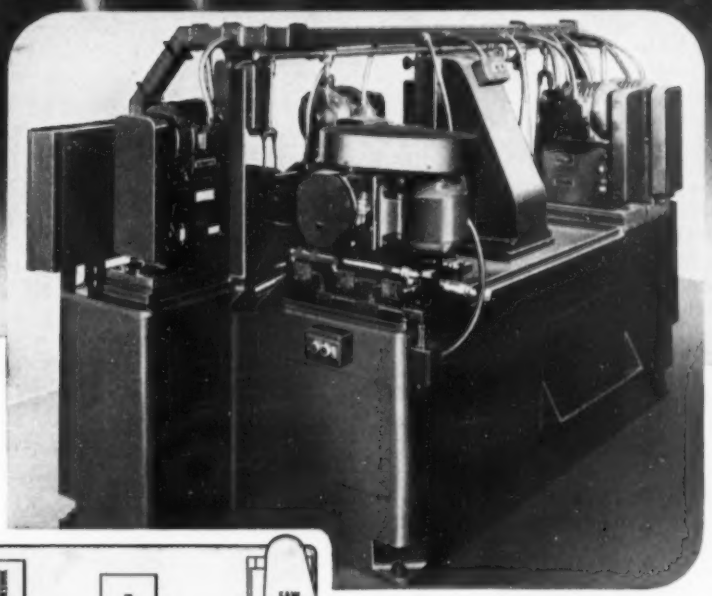
The No. 10 guillotine plate and angle punch for punching angles, webs of sections, or flat plates, has been added to the Beatty line.

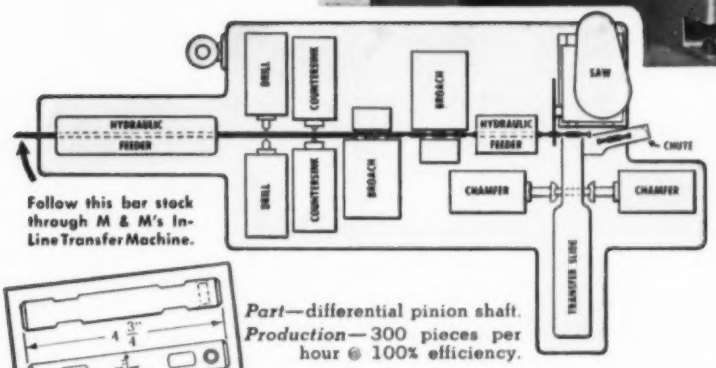
Unit has a 250-ton capacity, and is furnished with tools and positioners. Distance between housings is 74 in.; ram is 72 in. long, right to left; 24 in. front to back, with a 2½-in. stroke.

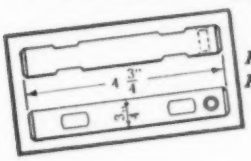
Beatty Machine & Mfg Co, Hammond, Ind.

MP/SF

Typical M & M progressive IN-LINE automatic transfer machine.





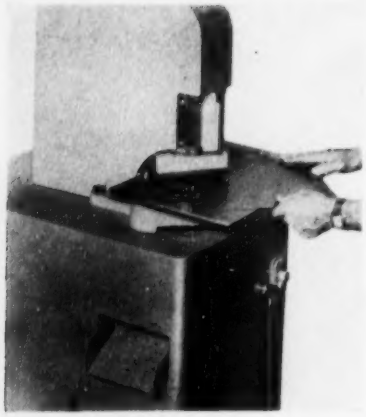


Part—differential pinion shaft.
Production—300 pieces per hour @ 100% efficiency.

Motch & Merryweather's forward-looking design *unitizes* a number of operations in the same machine. You obtain maximum usable production per square foot of floor space. Furthermore, you effect the greatest possible savings in time, overhead and operating costs.

Manufactured by —THE MOTCH & MERRYWEATHER MACHINERY CO.—
CLEVELAND 13, OHIO
Builders of Circular Sawing Equipment, Production Milling, Automatic and Special Machines

PRODUCTION-WITH-ACCURACY • MACHINES AND EQUIPMENT



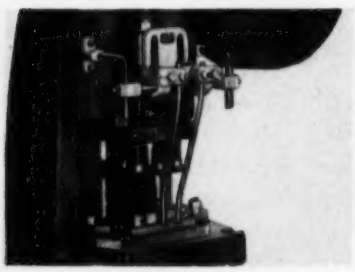
Power Machine For Notching Sheet Metal

Use of the Di-Acro power notcher in some metalworking operations is said to save a large part of the cost of expensive dies and heavy presses. A notch as large as 6x6 in. can be made in 16-gage sheet steel; notches both larger and smaller than 90°, as well as some straight shearing jobs, can be performed by making a few simple adjustments.

The 180-stroke per minute unit has a foot-actuated clutch which leaves the operator's hands free for work handling. Single-stroke clutch action prevents accidental work damage. Flywheel is driven by either a single- or three-phase ½-hp electric motor.

The portable machine, which weighs 465 lb, has a 12x18-in. worktable. Price $640.

O'Neil-Irwin Mfg Co, 512 Eighth Ave, Lake City, Minn



Power Press Safety Guard

Safety guard designed for power presses up to 4-in. stroke is composed of two guard arms actuated by the press ram. These push the operator's hands away from the danger area as ram starts to descend.

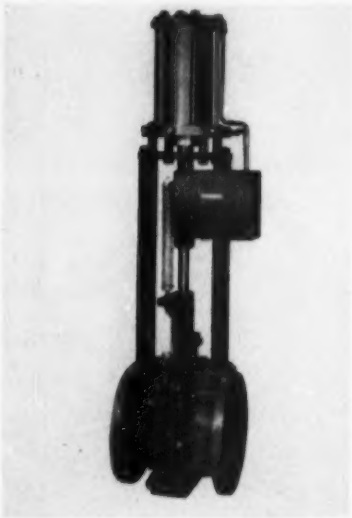
Arms may be arranged to sweep directly over the lower die, or to guard the front, back, or side, or a combination of these positions.

Cooper Weymouth, 277 Noble Ave, Bridgeport 8, Conn

Process Bonds Rubber to Metal

A special process bonding natural, synthetic, or silicone rubber to metal allows parts with metal cores to be ground concentric to tolerances ±0.002. Nuts and bushings of rubber and metal can be tightened without breaking, and metal can be used in many rubber items where rigidity as well as resiliency is required.

Advance Rubber Co, 1702 Washington Ave, Minneapolis, Minn



Poweractor Unit Positions Cylinder-Operated Devices

This Poweractor positioner insures accurate positioning of cylinder-operated devices.

Operating from a standard 3-15 psi pneumatic controllers signal, it applies a high pressure, pneumatic differential across a cylinder piston, sufficient to produce the position demanded by the controller.

Designed especially for use with the Foxboro Stabiload cylinder, the unit will position equipment requiring long stroke and power, such as large size control valves, dampers, variable speed drives, Saunders and Pulp Stock valves, through pneumatic cylinder (or springless diaphragm) operating mechanisms.

The positioner is capable of handling up to 150 psig air supply, depending upon cylinder rating; it responds to a change in signal pressure of ¼ of 1% of range, and positions a piston within 1% of its total stroke under normal loading conditions. Direction of piston movement with respect to a signal pressure may be reversed by simply inverting the positioner. Air connections are ¼ in. NPT.

The Foxboro Co, Foxboro, Mass

Easily-Installed Servo Tester For Rapid Field Maintenance

The 101-A servo tester is designed for rapid field maintenance and production testing without additional instrumentation.

Transient response of the loop under test is shown on a 3-in. cathode ray screen and viewed through a mask onto which has been previously drawn the response specified by the manufacturer. Operator adjusts the servo loop to match the two traces; if this is impossible, loop is declared inoperative and returned for repairs.

A standard servo test receptacle is installed on the equipment to be checked and wired into the data system; a single cable connects this plug to the 101-A.

Industrial Control Co, Wyandanch, LI, NY

Sheet Metal Slitting Attachment

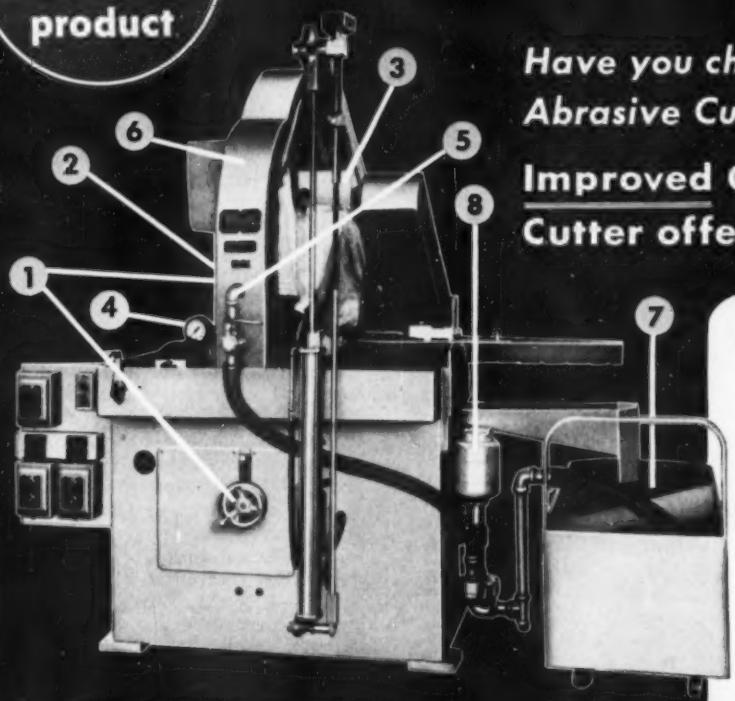
New slitting attachment provides power shearing for sheet metal of 20 gage or lighter, and handles any lengths from 1 in. to infinity, holding a tolerance to 1/32 in. on an 8-ft sheet.

It is equipped with a mechanically operated back gage, always parallel to the shear line. Unit will shear as little as ⅛ in. from a sheet, or guide can be set as far back as 24 in.; any slitting job can be handled on material as wide as 48 in.

Lockformer Co, 4615 W Roosevelt Rd, Chicago 50, Ill

an ACCO product

CAMPBELL ABRASIVE CUTTERS



Have you checked on Abrasive Cutting lately?

Improved Campbell No. 406 Cutter offers these features:

1. **BRIDGE TYPE WORK CLAMP** on both sides of cutting wheel, quickly and easily adjusted
2. **WHEEL GUIDES** for more accurate cuts . . . reduces wheel flutter
3. **CUTTING WHEEL OSCILLATION** for quality cutting over 2" diameter solids
4. **LOW PRESSURE SELF-CONTAINED HYDRAULIC SYSTEM** for operating controls
5. **EASILY ADJUSTED, SIMPLIFIED, RUGGED COOLANT DISTRIBUTOR** to insure adequate supply of coolant on both sides of cutting wheel
6. **COMPLETELY ENCLOSED CUTTING WHEEL** for operator's safety
7. **SEPARATE COOLANT TANK** . . . large capacity . . . may be easily removed for cleaning
8. **EXTRA-LARGE CAPACITY COOLANT PUMP**

—plus many other valuable features!

CAMPBELLS *Save You Money*

• Even old model abrasive cutters made big savings by reducing the cut-off time per piece, but the new improved CAMPBELL Abrasive Cutters—with their many new time and effort reducing features—show still greater efficiency and savings. CAMPBELLS pay for themselves out of savings.

Check the methods and equipment you use. On many jobs cutting time can be reduced up to 75%. Machines can be furnished in fully automatic or semi-automatic types.

Write today for Bulletin **DH-260** which tells you how to modernize your cutting procedure with a CAMPBELL 406. Then give us details of the job to be done so we can make recommendations and quote prices.

ACCO

TRADE MARK

CAMPBELL MACHINE DIVISION
AMERICAN CHAIN & CABLE

923 Connecticut Ave., Bridgeport 2, Conn.

CAMPBELL
Abrasive Cutters and Nibblers

Powder-Cutting Equipment For Stainless and Alloy Steels

A new Ferrojet powder-dispensing unit for powder-cutting of stainless and other hard-to-cut steels is available.

The redesigned, lower-cost model provides greater uniformity of powder flow as a result of improvements in the regulating and ejecting mechanisms. Dispenser and a cylinder of the powder-conveying gas can be mounted on an ordinary two-wheel gas cylinder truck.

Gas pressure and rate of powder flow are maintained automatically by the dispensing unit. Automatic powder control valve operates simultaneously with the turning on and shutting off of the cutting oxygen valve on the torch. Both machine and hand cutting torches are available for use with the dispenser.

National Cylinder Gas Co, 840 N Michigan Ave, Chicago 11, Ill

Versatile Ratchet Wrench

TAC open-end ratchet wrench permits the introduction from any side of the socket over and completely around a pipe or tube and straight down on the fitting. There the socket engages nut or bolt and ratchets it as fast as the arm can swing.

The wrench head ratchets by means of internal pawls, which act upon teeth cut into an extremely strong ring which travels in a circular channel around the wrench head. As little as 7° clearance for the regulation square drive handle will permit normal functioning without danger of bending.

Sockets, available in a range from ⅜ in. to 4 in. and 1/16 in. increments in 64 sizes, make it possible to do the work of an open-end wrench, adjustable, box, socket, and ratchet wrench; additional adapters provide for greater versatility.

Tubing Appliance Co, Los Angeles, Calif

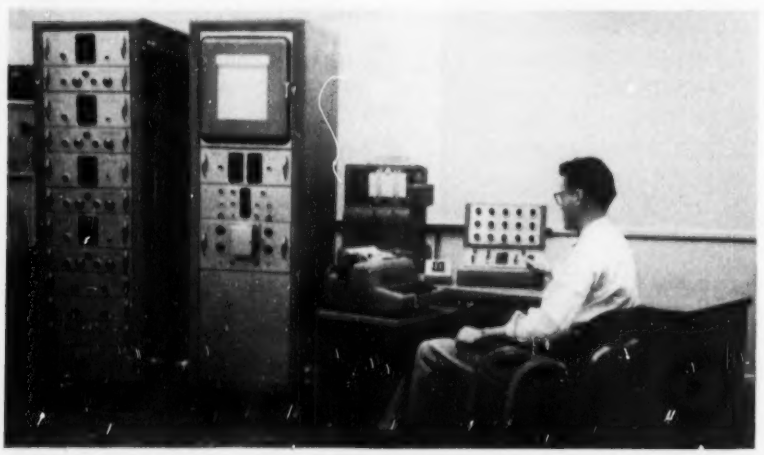
Coolant Pump

This self-contained coolant pump system, called the Bantam, has only one moving assembly, eliminating gears and other close-fitted parts.

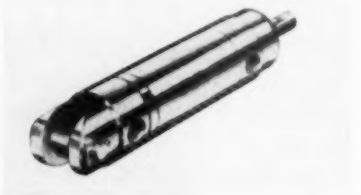
Capacity is 400 gph at zero head; 300 at 2 ft; 225 at 4 ft; 200 at 6 ft. Lower volumes with higher-than-water viscosity. Motor is 1/30 hp, 1500 rpm, totally enclosed, single phase. Five-gallon tank has a corrosion-resistant lining.

Standard equipment includes a 6-ft oil-resistant discharge hose with flow control valve and nozzle, conduit box, start-stop switch, 8-ft. electric cord, plug and removable filter screen. Shipping weight 10 lb.

Samuel S Gerber Co, 162 N Clinton St, Chicago 6, Ill



ANALOG-TO-DIGITAL CONVERTER, called the Sadic, completely eliminates the analog plot and directly converts the test measurements from standard pressure pickups, thermocouples, and strain gages to numerical values. These are immediately and automatically typed or printed out on tapes, or can be punched into standard cards. Numerical measurements are accurate to within 1 part in 1000, and can be sampled as often as once every second. Standard, commercially available transducers and pickups are used as the original sensing elements for stress, strain, pressure, acceleration, temp, and other phenomena. ***—Consolidated Engineering Corp, 300 N Sierra Madre Villa, Pasadena 8, Calif***



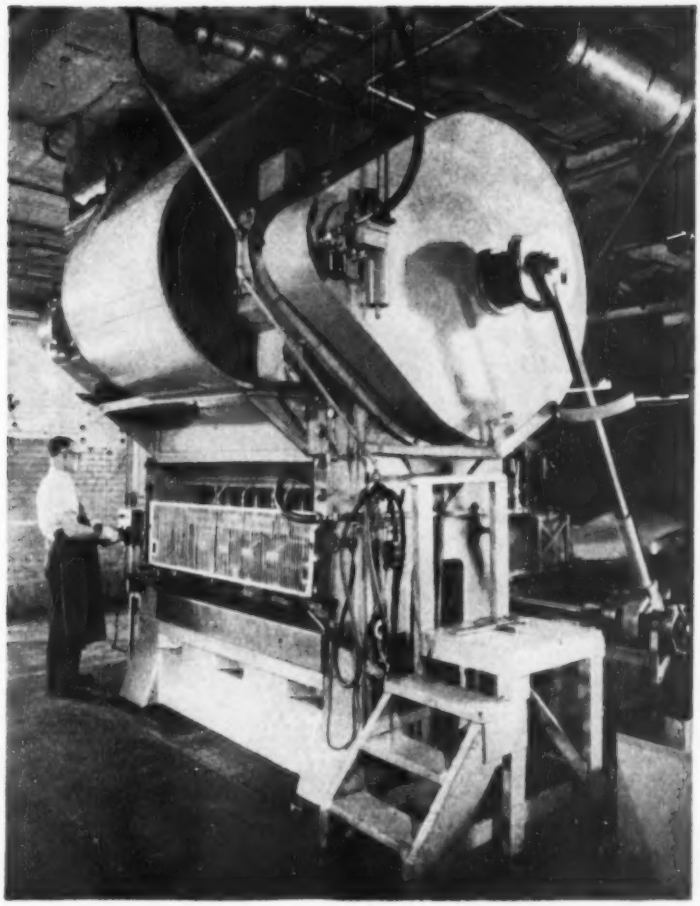
Air Cylinders Save 40% Mounting Space

T-J Spacemaker air cylinders has added a new model to its line, designed to eliminate tie rods and reduce head size, and to save up to 40% in mounting space.

Cylinders are equipped with the company's flexible seals which insure positive cushion with automatic valve action for fast return stroke.

Relative port positions may be rotated without disassembly of cylinder and locked in desired position. Mounting holes are counterbored for socket head screws; units have solid steel heads and heavy-wall seamless steel body.

Tomkins-Johnson Co, Jackson, Mich



All main bearings and slideways protected by Minster's automatic oil lubrication system with return. The oil lubrication to the main bearings is under heavy pressure. Oil to the slideways and other bearings is supplied by the same system but is under gravity flow.

MINSTER PRESS CUTS 80,000 POUNDS OF STEEL DAILY FOR 6 YEARS WITHOUT A BEARING FAILURE

Complete, convenient protection to main bearings and slideways is a "must" with modern automatic production presses. You get that protection with Minster's automatic oil lubrication system, first installed on a Minster press in 1939.

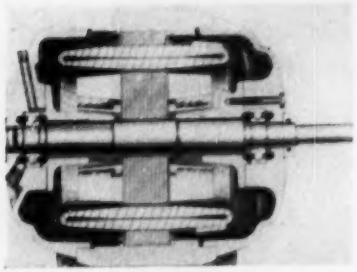
Typical performance record is that of the press illustrated . . . 80,000 lbs. of steel cut up daily for six years without a single bearing failure.

Minster's automatic oil lubrication system creates a protective film on bearing and slideway surfaces having extremely close clearances. It proves the necessary frequency of lubrication as well as eliminates possible operator forgetfulness. It is a return system with central pump, two filters and reservoir.

Automatic oil lubrication with return is an important contribution pioneered by Minster. It is another example that proves the statement: Minster is first in press design.

MINSTER
FIRST IN Press DESIGN

THE MINSTER MACHINE COMPANY, MINSTER, OHIO

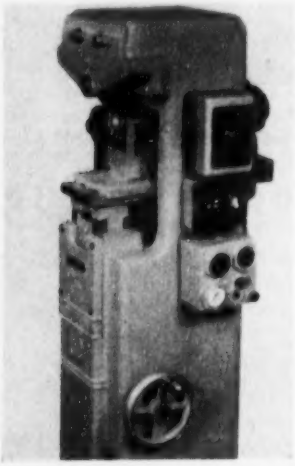


Drain Plug Releases Moisture From Totally Enclosed Motor

This totally enclosed, self-cooling motor, designated as Type SS, has been designed for services where dampness, dust, fire hazards, and corrosive fumes are prevalent. Drain plug releases water from the interior to eliminate moisture condensation.

Types SS and SES are available in a range of from 1/3 to 2 hp, also fan-cooled to 75 hp. Units are equipped with Lubriflush bearings which provide an extra large lubricant chamber and provision for forcing the grease through the bearing for a thorough purge of old grease.

US Electrical Motors, Box 2058, Terminal Annex, Los Angeles 54, Calif



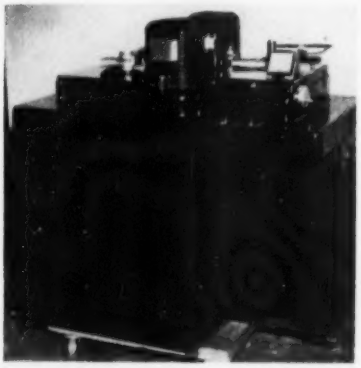
Marking and Graduating Machine

Roll-O-Mark Model 336 is a marking and graduating machine designed primarily for machine tool dials and collars. It permanently roll-marks graduations and figures into workpieces of steel, aluminum, or cast iron. The machine has a capacity for parts with a straight diameter up to 6 in.

Accuracy is maintained by gearing the die and the work and by maintaining proper relationship between die and work dia. A pneumatic table makes it possible to compensate for slight variations in work dia to produce dials of machine tool accuracy.

The unit is power-operated and fully automatic in operation. Dials to be marked are placed on a work adapter on the work spindle and the operator then is required merely to start the machine cycle.

Noble & Westbrook Mfg Co, East Hartford 8, Conn



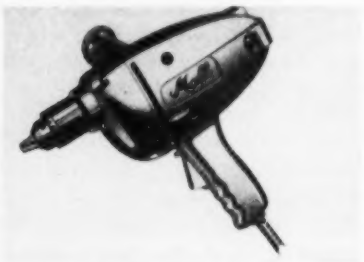
X-Ray Spectrometer

Norelco 90° Geiger counter X-ray spectrometer is available for use in production control. The instrument is equipped with an air-cooled X-ray tube and a goniometer having a radius of 130 mm, which reads directly in degrees, with a separate dial reading in hundredths.

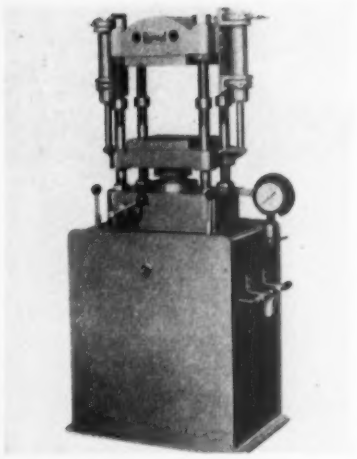
Angular range is −10° to +90°; angles can be read directly from a dial or from a strip chart. Geiger counter position is continuously readable to 0.01° over the full range. X-ray generator provides operation at 35 kvp at 6 ma, and operates on 200-240 v, 50 or 60 cycles.

The unit, which is easily aligned with gages and fixtures provided as part of the equipment, measures 24 in. wide, 40 in. high, and 43 in. long.

Research & Control Instruments Div, North American Philips Co, 750 S Fulton Ave, Mount Vernon, NY



PORTABLE POWER MallDrill model 127 for grinding and drilling can be utilized for both heavy- and light-duty operations. Equipped with an ac, dc motor, geared chuck, and a trigger switch, unit has a spindle speed of 500 rpm.—*Mall Tool Co, 7725 S Chicago Ave, Chicago 19, Ill*



30-Ton Plastic Molding Press Available With Air Pushbacks

This 30-ton plastic molding press is equipped with air-operated pushback cylinders for powered ram return.

Hydrolairs, which take their power entirely from the shop airline, have a high-pressure stroke, without the usual motors and pumps. Selected pressure is automatically applied and maintained, even on compressible materials. In addition to the model illustrated, units are available in the standard 50-ton floor model with either lever or electrical control, and in 30-ton bench and floor models with lever control only.

Elmes Engineering Div, American Steel Foundries, 1150 Tennessee Ave, Cincinnati 29, Ohio

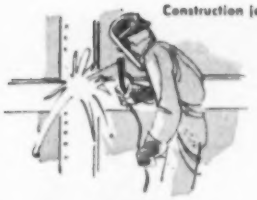
Solenoid Pilot Valve

Solenoid pilot valve 3 inches high, handles air, vacuum, oil, water, and inert gases. Standard coil, adaptable to either continuous or intermittent service, is completely sealed from, but is cooled by the fluid or air passing through the valve. Unit has only two moving parts, plunger and one-piece unbreakable stem. Models include 2-way, and 3-way either normally open or normally closed. Orifice sizes available are: 1/16 in., 3/32 in., and ⅛ in. with ¼-in. pipe tap. Retails for $12.35.

Valvair Corp, 983 Beardsley Ave, Akron 11, Ohio

A.O.Smith Field-King

2½ KW Auxiliary Power



Construction jobs

Pipeline welding

Available in 200 and 300 Amp. models

The gas engine driven welder with the features YOU wanted!

All-electric dual control provides continuous, stepless current adjustment with constant engine speed!

Electric idling control, unlike other types which can easily clog or get out of order, assures perfect adjustment at all times and practically no maintenance!

Auxiliary D. C. power is a full 2½ kilowatts, the largest available in any standard engine-driven machine!

A rugged machine with less bulk! A field welder with 25% extra horsepower that guarantees smoother, easier welding!

Lighter weight! The Field King 200-Amp. model, for example, weighs only 985 pounds. This is achieved by modern torsional mounting. This lighter weight means greater mobility and lower shipping costs.

Greater fuel capacity! The larger gas tank means a full nine-hour working day without stopping to refuel.

A safer machine! Extra baffle plates on each side of the gas tank prevent accidental fires caused by unintentionally bumping the electrode against the gas tank.

It's the field welder you've been asking for . . . now available with the A. O. Smith name, guarantee and reputation behind it.

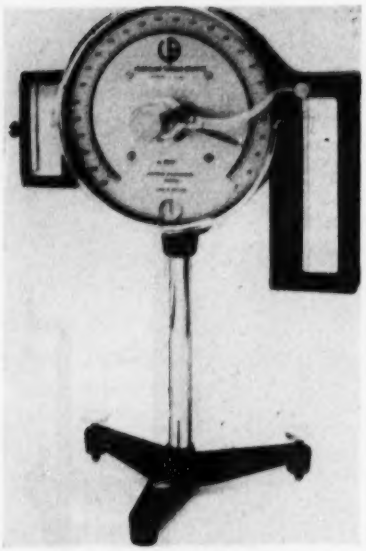
Contact your A. O. Smith dealer for full details, or write:

A. O. Smith Corporation
Welding Products Division
Dept. AM-153, Milwaukee 1, Wis., U.S.A.

Made by welders . . . for welders

A.O.Smith
WELDING PRODUCTS

Welding Products Division, P. O. Box 584, Milwaukee 1
International Division, P. O. Box 2023, Milwaukee 1, Wisconsin, U.S.A.

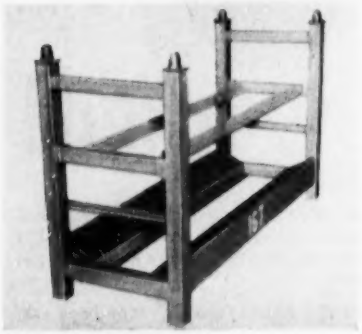


Precision Torque Balances

A line of precision torque balances, manufactured in Holland, is equipped with a system which eliminates mechanical axle friction. Special damping device speeds weighing, but does not affect sensitivity; a reading device eliminates parallax and makes a vernier unnecessary.

Models range in capacity from 1 mg to 20 g, with sensitivities from 0.002 to 0.02 mg.

Ohaus Scale Corp, 1050 Commerce Ave, Union, NJ



Coil Storage Rack Has Removable Tray

New stacking coil rack has a removable tray or shelf which facilitates placement of two rows of small-dia coils one above the other. Shelf and rack have two longitudinal supporting rails set at 45° to prevent marking stock.

Ends of intermediate shelf rest in U brackets welded to the uprights; no bolts or other attaching devices are employed. Frame can be lifted out of the rack, making it suitable for handling large-dia coils.

Equipment Mfg Co, Inc, 21550 Hoover Rd, Detroit 5, Mich

SERIES 548 AND 549 COVER GOGGLES to fit over regular glasses have wider bearing surfaces which eliminate pressure points and seal against flying particles or light flashes in welding and chipping. 50-mm lenses, replaceable from the front, sit flush with rings; three adjustable headbands available. — *Chicago Eye Shield Co, 2300 Warren Blvd, Chicago, Ill*

Tricop safety switch is an attachment for portable or commercial drills, installed by removing cover plate screws, attaching wires, replacing plate. Check key must be inserted in switch after use to complete electrical circuit; otherwise, equipment is inoperative.

Tricop Distributing Co, 308 W Center St, Akron 2, Ohio

Free flowing copper cyanide of exceptionally uniform quality, and whiter in color than formerly supplied, is available from a new source of domestic production. Immediate shipments can be made under the Kaynide label.

Kraft Chemical Co, Kaynide Div, 917 W 18th St, Chicago 8, Ill

A push-on fastener is available in four types, each featuring a nonslip grip that bites deeper with use into the surface of the stud. Biting action holds equally well on soft plastic, metal, fiber, or polished and ground studs, straight or tapered. Fastener will handle variations as much as 1/64 in. in stud dimension.

Prestole Corp, Toledo, Ohio

Pressure-sensitive, pre-printed adhesive tape has been developed to eliminate drafting of repetitive symbols in plant layout planning. All standard symbols for walls, aisles, conveyors, shafts, stairways, etc, are available in either 324 in. or 648 in. rolls, scale ¼ in. to 1 ft, in opaque or transparent types. Representative selection of 15 symbols and 20 different rolls may be obtained in kit form, including a specially designed cutting knife and detailed instructions.

Labelon Tape Co, 450 Atlantic Ave, Rochester 9, NY

Workbench is available with a satin-finish top of laminated hard maple, reinforced with bolts, and secured to a girder-construction base that can be screwed or bolted to the floor if desired. Table tops are made in 2- or 3-in. thicknesses. Standard sizes are 30 in. x 48 in.; 30 in. x 60 in.; 30 in. x 72 in.; 30 in. x 96 in. tops.

Shore Woodwork Co, 894 N 40th St, Philadelphia 4, Pa

Wiretex, a flexible, high-pressure industrial rubber hose, is designed to carry various types of gases or fluids under both high and low pressures. Has a mandrel-cured, Reprene tube in lengths up to and including 60 ft. Hose is not weakened by constant vibration or flexing, and it will not rust or corrode.

Republic Rubber Div, Lee Rubber & Tire Corp, Youngstown 1, Ohio

Neoprene rubber mesh for lining tote boxes and covering worktables prevents delicate articles from being scratched or jarred during manufacture and assembly. Neotex is about 3/16 in. thick with ⅜-in. diamond-shaped openings; it is tough, strong, and abrasion-resistant. Available in green, black, red, and yellow in rolls 26 in. wide and 50 ft. long. Any desired shape can be cut with ordinary scissors.

Research Products Corp, 1015 E Washington Ave, Madison 10, Wis

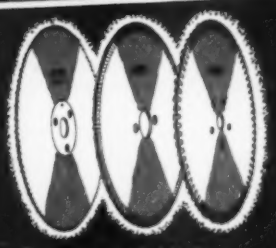
All-steel workbenches are equipped with maple tops, sanded and finished with paraffin on face and edges. Available in standard widths of 24, 30, 36 and 42 in., and lengths of 3 ft., 4 ft. 6 in., 5, 6, 8, 9, and 10 ft. Tops may be obtained in any widths up to 48 in. and any lengths up to 16 ft.

The Industrial Bench and Equipment Mfg Co, 97 South St, New Britain, Conn

Dip-Pak materials for plastic coating small tools are hot-melt, strippable, plastic coatings for temporary protection during processing, storage, and shipping. The plastic briquettes are melted in an electric or oil-jacketed pot. After dipping, the metal object is coated with a tough, abrasive, moisture- and shock-resistant, transparent film. Protected parts do not show any sign of rust or corrosion, even after over 700 hours of exposure at 105 F, 100% humidity. Formulas No. 595 and 597 are removed by slitting with a knife and peeling. Peeled material may be reused after remelting.

Fidelity Chemical Products Corp, 470-474 Frelinghuysen Ave, Newark, NJ

Here's a "Short" of SIMONDS Metal-Cutting Line

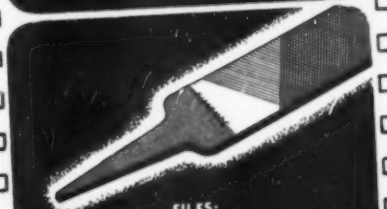


CIRCULAR SAWS:
Most complete line of types and sizes . . . Solid, Segmental, Inserted-Tooth, Carbide-Tipped, for cutting any type of metal faster, smoother, straighter.

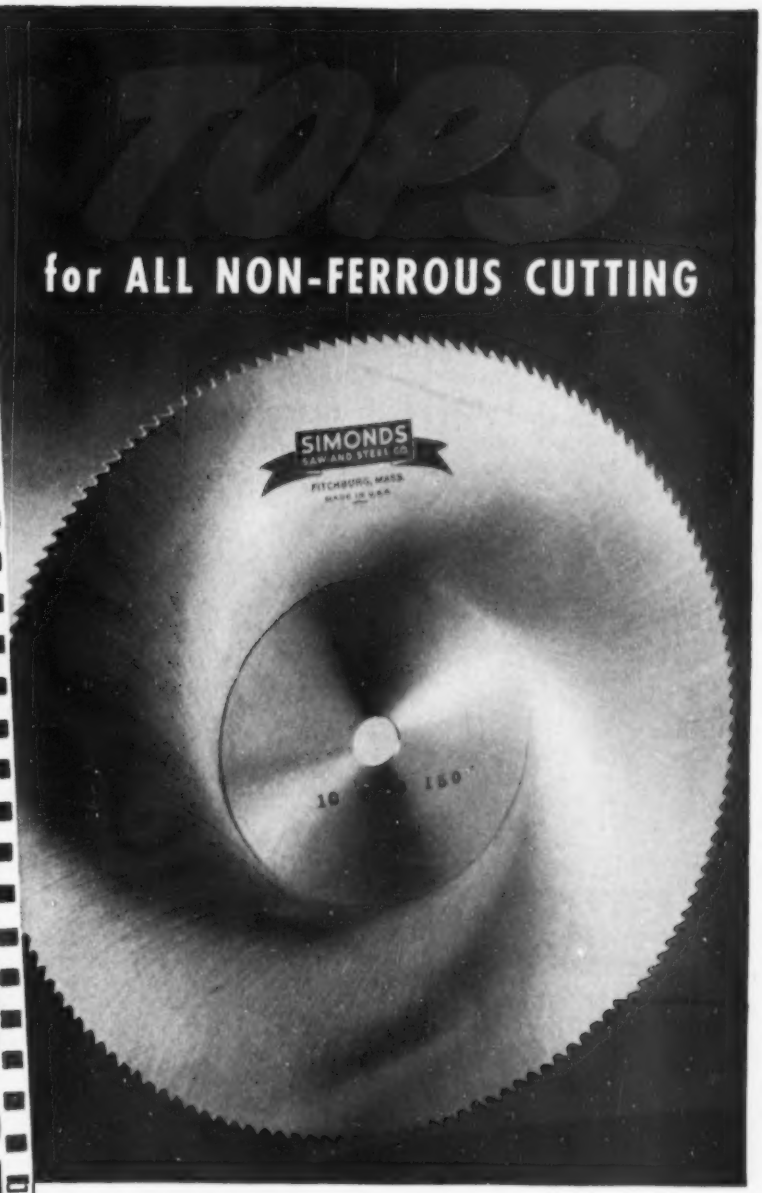
BAND SAWS:
Regular Hard-Edge Band Saws, also Skip-Tooth Hard-Edge, and Spring-Temper Band Saws . . . all 3 run more easily.

SHEARS:
"Red Streak" Rotary Shear Knives for clean cutting of strip or sheet. . . . "Tungsweld" Squaring Shears give you Sharp savings in cutting thin metal.

HACKSAW BLADES:
Famous "Red End" Blades for hand or power cutting . . . for top money's worth on any hacksaw job.



FILES:
Only Simonds "Red Tang" has the teeth like a metal-cutting saw . . . teeth that remove more metal with less effort.



On all non-ferrous metals, here's the toughest, most "stand-up-and-take-it" saw made . . . with a proven production record on everything from light-wall sections to solids.

SIMONDS heat-treats these saws for individual applications, according to speed, type of material, and machine. And SIMONDS design assures top cutting efficiency . . . with correct tooth-shape that eliminates clogging of gullets . . . with high, smooth finish that resists adherence of chips to plate . . . and with proper clearance for freer, cooler, straighter cutting.

Standard sizes are immediately available from stock . . . so see your Simonds Distributor *today*.

SIMONDS
SAW AND STEEL CO.
FITCHBURG, MASS.

Factory Branches in Boston, Chicago, San Francisco and Portland, Oregon. Canadian Factory in Montreal, Que. Southern Service Shop in Morristown, Tenn. Simonds Saw (Ltd.), Simonds Division: Simonds Steel Mill, Lockport, N. Y., Simonds Abrasive Co., Phila., Pa. and Arvida, Que., Canada

A two-finger tapper . . . but he knows his wheel types!

SIMONDS ABRASIVE CO.

Grinding Wheels

No need to fumble for the right type of grinding wheel.

Simonds Abrasive Company's complete line has everything from giant wheels for production grinding to abrasive grain for polishing . . . everything you need for finishing, shaping, cutting-off, smoothing or sharpening.

You'll find our free data book mighty helpful. It gives wheel recommendations, lists specifications and suggests methods for safe, productive grinding. We'll gladly send it, together with name of your Simonds distributor. He can save you time, trouble and money. Write.

SIMONDS ABRASIVE CO., PHILADELPHIA 37, PA. BRANCH WAREHOUSES: CHICAGO, DETROIT, BOSTON
DISTRIBUTORS IN PRINCIPAL CITIES

Division of Simonds Saw and Steel Co., Fitchburg, Mass. Other Simonds Companies: Simonds Steel Mills, Lockport, N. Y., Simonds Canada Saw Co., Ltd., Montreal, Que. and Simonds Canada Abrasive Co., Ltd., Arvida, Que.

ROUND TABLE *Discussion*

WHO RATES THE BOSS?

Is a foreman-rating card, to be filled out by the shop men, a healthy idea for general morale? Would such a policy result in overboard criticism, or might it not bring to light a few weakneses which the foreman could easily correct?

"WHAT IS sauce for the goose is gravy for the gander" may aptly be applied to the objections of a foreman to merit rating, when he himself is the object of such rating by his men.

Having the foreman rate his workers is now an accepted industrial practice in determining and evaluating the qualifications and progress of such workers.

It is believed that the results of any rating of foremen by their workers should ultimately be turned over to management for its consideration and study. One of the chief results from an attitude survey, such as foreman-rating by workers, is the knowledge it gives of different foremen. It will even be possible to prepare a percentage comparison between departments. This usually leads to increased interest on the part of the foremen and department heads in strengthening the morale of their departments and in unearthing the factors that have been responsible for poor attitudes on the part of the workers.

These factors are disclosed by the specific form of the foreman-rating questionnaire. When physical and environmental factors are the same as in other departments, and one department is significantly below that of the others in employee mo-

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From The World's Most Complete Stock of Standard Carbide Tools

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Super TOOL COMPANY

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FREE ON REQUEST

Here are the answers to most of your questions as to what "ONE-TWO-THREE" means in describing this outstanding development of Automatic Chucking Machines by Goss and De Leeuw. You'll be interested not only in the revolutionary design of the machine itself, but also in its extraordinary performance—and how it is possible to handle from one to three operations—in sequence or simultaneously without changing set up.

Get this interesting, informative Bulletin NOW—by merely asking for it.

GOSS & DELEEUW

GOSS and DE LEEUW
MACHINE COMPANY, KENSINGTON, CONN., U.S.A.

rale, the factor usually responsible is unsatisfactory relations between the foreman and a considerable percentage of the employees.

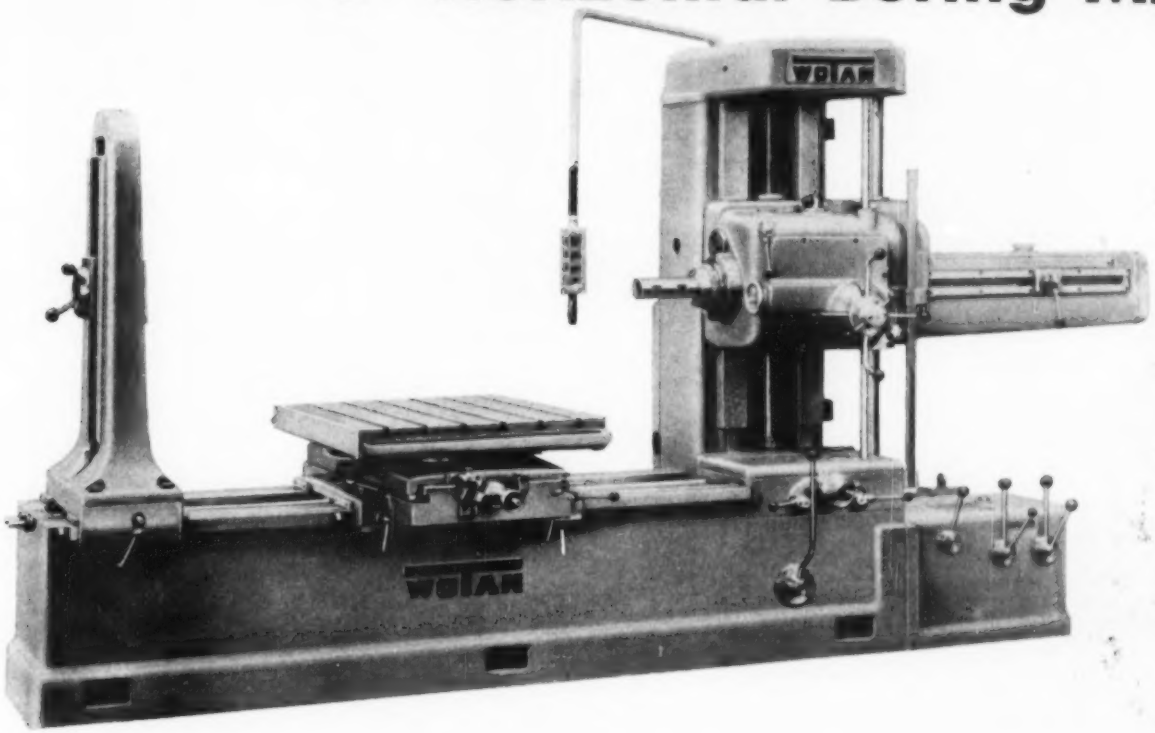
Usually such attitudes are expressed by the workers on a foreman-rating sheet in the form of complaints about the foreman, such as: not qualified for his job, does not know how to handle men, cannot discipline men, criticizes unjustly and improperly, does not give a worker credit for what is done, will do nothing about complaints, does not play fair, and shows favoritism. These complaints are potent determiners of workers' attitudes. When a small number of workers give voice to them, the real cause may be in the complainers, but when a reliable percentage gives them, it is fair proof that the management needs to do a better job of selection and training of foremen. Often the remedy for these complaints is not difficult to administer. Many foremen will improve quickly and noticeably when they see the results of a good foreman-rating survey. Others will be surly and sullen, deny the justice of the complaints and otherwise prove that they never should have been foremen in the first place.

In many organizations, the foreman is a virtual ruler in his own right. He makes the rules. The workers can follow them or be told to go somewhere else. It is true that this condition does not exist in all plants. But traditionally the foreman runs his department as he sees fit, with very little interference or supervision from management, as long as he obtains results. Given a foreman who can get out the work, many company presidents or fac-

"Production Control wants to know how many size eight heads we've got."

WOTAN

3″ Horizontal Boring Mill



- Table Top swivels full 360 .
- Centralized Controls.
- Power Rapid Traverse in all directions.
- Roller bearing nitrided spindle.
- 18 speeds — 17 to 910 R.P.M.
- 18 feeds — .001" to .500".
- Feed dials read in .001".
- Morse taper #5 in spindle.
- 10 H.P. V-Belt motor drive.

IMMEDIATE DELIVERY

Full Details will be sent upon Request

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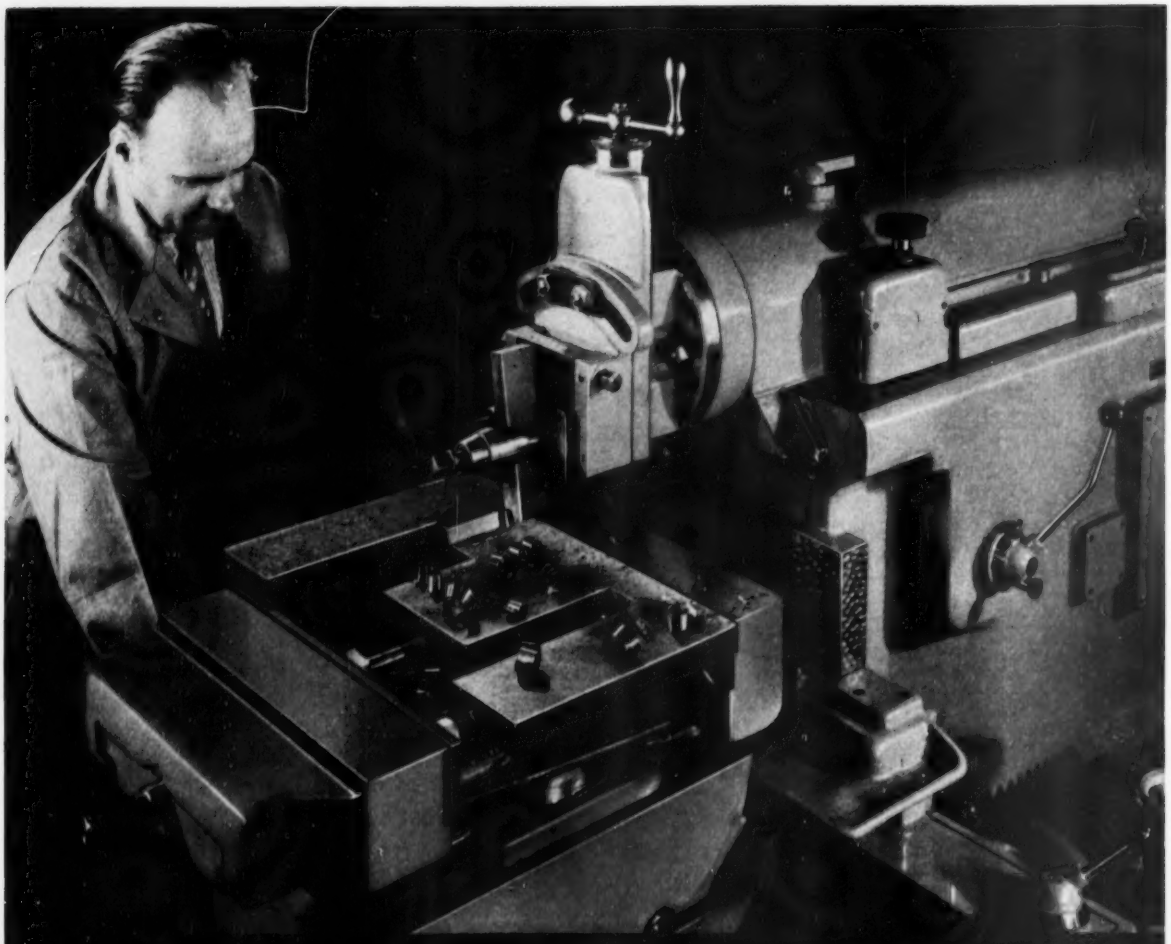

INCREASE YOUR OPERATING EFFICIENCY...
with ROCKFORD HYDRAULIC SHAPERS

Hydraulic drive permits you to change stroke lengths instantly, even while the shaper ram is in motion. It also gives you a wide range of cutting speeds and feeds, infinitely adjustable.

With flame-hardened and ground ram ways, Rockford Shapers assure long life and constant accuracy for maximum operating efficiency.

Ask a Rockford Machine Tool Co. representative to show you how you can increase your operating efficiency with Rockford Hydraulic Shapers.

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Hy-Draulic

ROCKFORD MACHINE TOOL CO.
2500 Kishwaukee Street • Rockford, Illinois

tory superintendents will wink at practices which they know to be destructive of the confidence and morale of their workers. It is in this area of management that labor trouble is born. And here is where foreman-rating cards filled out by the workers will show up any bad morale conditions which will ultimately affect efficient production.

A good foreman-rating card to be filled out by the workers should cover such questions as: "How well is your work planned for you; how much instruction do you get when you are given new work or new methods on the job; how are the tools and equipment you use in your work kept; how are the physical conditions under which you have to work; does the foreman give you enough information about company policies; does the foreman encourage the practice of good safety methods of work; if you were to give your boss a good suggestion for a new or better way of doing a job, how likely would you be to get credit for it; how do you like the suggestion system; do you feel that you get due credit for the work you do; how interesting is your job; when there is a better job vacant, how often do you feel that the best qualified person gets it; do you think your foreman makes clear-cut and final decisions; are you working in the department you prefer; have the dangers or hazards connected with your job been pointed out to you; does your foreman spend any time training you how to do a better job; does your foreman ever use harsh and unkind words in correcting you; when your suggestions are used, do you get credit for them; do you know how you stand with your foreman; do you believe you are in line for a promotion; are you afraid of being fired for some slight thing or for little cause; if you had any cause for dissatisfaction, what would your chances be of getting a fair hearing and a square deal; do you feel that

"Speak up, man! Did you send for me?"

Savings reported by users of LINCOLN PARK CARBIDE GAGES

LESS GAGE REPLACEMENT
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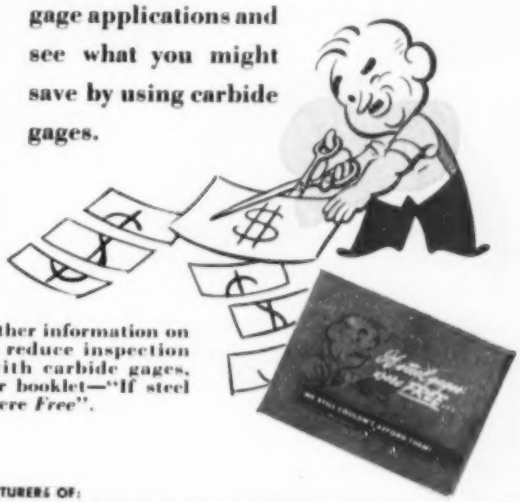
MORE PARTS PASSED

LISTEN TO THIS . . .

"a lone $38 carbide gage saves us $4,000.00 a year"—"we cut gage checking expenses $20,000.00 annually with carbide gages"—"our initial gage costs reduced $1,280.00 in nine months on a single part inspection"—

Unbelievable? Not at all; Lincoln Park customers prove these statements with actual records. Take a look at your gage applications and see what you might save by using carbide gages.



For further information on how to reduce inspection costs with carbide gages, send for booklet—"If steel gages were *Free*".

MANUFACTURERS OF:
CARBIDE, CHROME PLATED, AND STEEL GAGES—CARBIDE ROTARY FILES. ALSO, FACILITIES AND SKILLED PERSONNEL AVAILABLE FOR PRECISION PARTS PRODUCTION.

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GET LONGER LIFE FOR *YOUR* DRILLS WITH OLIVER DRILL POINTERS

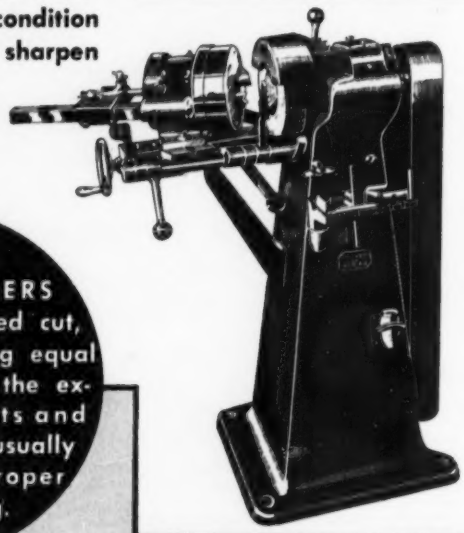
YOUR DRILLS WILL

- cut faster
- last longer
- produce more accurate holes

by machine grinding them on Oliver Drill Pointers.

OLIVER OF ADRIAN

To obtain best results, it is essential to use correctly sharpened drills. Remove twist drills from your machines and replace them at the first sign of dullness. Increase their wearing life by giving this condition prompt attention and sharpen them in the way that has been proved best—by machine grinding.



OLIVER DRILL POINTERS . . . give balanced cut, with each lip doing equal work, eliminating the excessive drill costs and imperfect holes usually traced to improper drill grinding.

No. 510 for drills ¼" to 3"—2-3-4 flute. Variable clearances. Variable point angles. Automatic operation.

No. 21 Oliver Bench Grinder. Hand operated for Drills No. 57 to ½" Right hand, with an improved point. Attachments are available for grinding oil hole drills, left hand and other special points.

Write for our free Booklet "How To Produce More Holes With Your Drills!"

See our catalog in Sweet's Directory

MACHINE TOOLS by OLIVER include:
AUTOMATIC DRILL GRINDERS
TOOL & CUTTER GRINDERS
DRILL POINT THINNERS
TEMPLATE TOOL GRINDERS
FACE MILL GRINDERS
DIE MAKING MACHINES

OLIVER INSTRUMENT CO.

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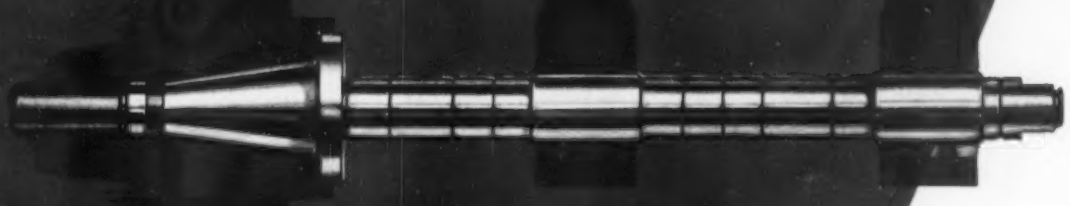
your foreman takes an understanding and sympathetic attitude toward you; when a difficult problem is presented, do you feel free to consult your supervisor; do you feel free to appeal to a higher authority in case your superior decides a point against you; do you receive embarrassing criticism in the presence of others; are your associations with superiors and fellow employees pleasant; what are your opportunities for advancement; do you feel you are paid what you are worth to the company; do you feel that your job is secure if you do good work; is supervision too lax or too severe; are you responsible to too many bosses; do you get conflicting or contradictory orders; what do you think of the boss; do you appreciate this opportunity to fill out this questionnaire and express your ideas and feelings to your foreman."

Of course some foremen claim that workers will not reveal attitudes honestly. It is their common complaint that attitude surveys are both silly and useless because workers will not state their opinions honestly, or fairly, or reasonably. Obviously, if workers anticipate being discharged because they complain, or if they anticipate constant nagging and revenge on the part of petty supervisors for honesty in answering questions, they are going to act accordingly. That is one of the reasons for complete anonymity in conducting the foreman-rating survey. Employees sometimes simply cannot believe they will be free from criticism or unpleasant consequences as a result of outspoken criticism in questionnaires. Nor can we trust some supervisors and foremen not to react unfairly if and when an employee complains in a way to reflect discredit upon them. To assure anonymity, the worker should not be required to sign his name on the

"Wonder how long it will take the Government to realize that the raise they just granted the Union will be coming out of our excess-profits tax money?"

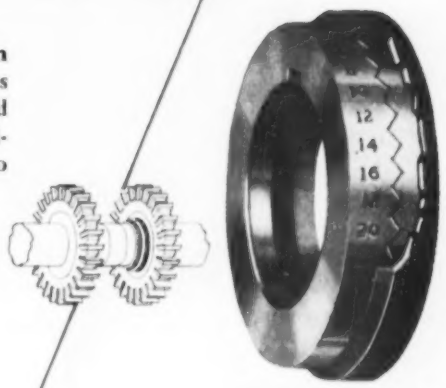
FOR FAST, ACCURATE, LOW-COST MILLING MACHINE OPERATIONS

use S-J ARBORS and ADAPTERS



Make heavy or light cuts fast and accurate with S-J rugged precision built Arbors. Arbor and pilot diameters held to plus .0006", minus .0005". Arbors filled with spacers and sleeves which have faces ground parallel within .0002"—makes cutters run true and take an even distribution of cutting load. Taper shanks are checked on light gauges to guarantee a perfect fit in spindles and minimize run-out.

Low-cost milling machine operations are assured when using S-J Arbors. Built from forgings, they are tough and withstand the punishment required of today's production. Mass produced, they meet the test of low-cost tooling—quality at low cost that can't be beat.

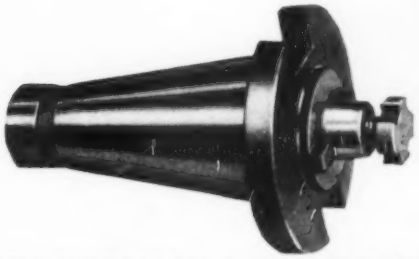


TIME-SAVING S-J ADJUSTABLE SPACING COLLARS

Save valuable time in making accurate adjustments between cutters on gang or straddle milling, and on multiple slotting set-ups.

HIGH PRECISION S-J SOLID SPACING COLLARS

Help assure true-running cutters. Carefully heat treated and faces ground parallel within .0002".



LARGE SELECTION S-J ADAPTERS

Style "C", Shell End Mill Arbor, shown here, is only one of the various S-J Adapters that enables you to convert spindles for driving a variety of tools, such as end mills, facing mills, keyway cutters.

Write for New Bulletin No. 2-50 showing complete line of S-J Arbors, Collars and Adapters.

Scully-Jones AND COMPANY

1902 S. ROCKWELL ST., CHICAGO 8, ILLINOIS

YOU GET LOW COST, FAST, ACCURATE PRODUCTION WITH OUR STANDARD AND SPECIAL TOOLS

GET DUMORE

the drill head with automatic built-in controls

Self-Contained Air
No cumbersome air lines to hook up. Simply plug into electrical outlet. Built-in rotary air compressor advances drill at *required* speed and feed for *new resistance drilling.*

New Resistance Drilling
Provides completely automatic operation. Self-compensating control of drill by combined action of Air Feed Pressure Regulator and built-in return spring allows material being drilled to govern rate of drill feed and speed.

Adjustable Stroke Control
Select depth of stroke by adjustable stop nuts. Allows *measured depth* drilling from 1/32" to 1-1/8". Can be controlled to .004" preciseness.

Air Feed Pressure Regulator
Permits adjustment of pressure up to 15 P.S.I. Allows for variation in drill size. This simple control governs rate of drill advancement in work.

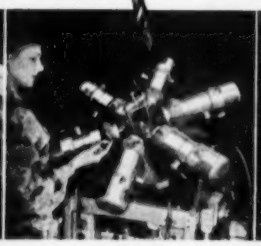
Automatic Chip Clearance
Depth Staging feature provides retraction of drill at proper intervals for chip clearance. Prevents drill breakthrough, practically eliminates costly drill breakage.

Maximum Drilling Production
Automatic operation of drill allows free use of operator's hands. Fast, one-time setup makes this machine ideal for simultaneous operations.

DUMORE

and get all these cost reducing benefits

Motor manufacturer doubled output on armature shaft drilling. Decreased drill breakage 25 times.



Unusual setup drills bronze nozzle holders. Labor costs slashed $75 on first run of 5273 pieces.

Sound equipment manufacturer cashed in on big savings. Cut drill breakage to the bone.

With the Dumore automatic drill head, you can say goodbye to excessive drill breakage, down time and scrap loss on small diameter, deep hole drilling. And just as important, you *increase* drilling capacity.

Get all the information about this revolutionary tool. Ask for demonstration. See how it eliminates operator guesswork and provides completely automatic control, flexibility of setup, big cost reductions at desirably low cost.

Call your distributor today, or write for bulletin.

THE DUMORE COMPANY
1337 Seventeenth Street • Racine, Wisconsin

foreman-rating card. After the worker checks the questions and completes the answers on the card, he drops the card into a collection box.

Much of the wrong attitude on the part of employees is not a result of top management's attitude, but of the lower levels of management such as foremen, time-study men, and others who come into contact with the men and "lord it over them," in one way or another. Good management is vitally concerned with seeing to it that its employees are treated properly, their dignity and rights respected, their grievances adjusted promptly and justly. Companies need to know what their employees are thinking.

In addition to the use of foreman-rating cards to be filled out by the workers, management would do well to make use of a formal rating plan for supervisors. This rating plan for supervisors, on the same order as a rating plan for shop-workers, should be filled out by the foreman's superior. Every progressive manager recognizes that where competent shop leadership is lacking, it is impossible to achieve maximum efficiency. Regardless of the care exercised in the selection of supervisors, the acid test of the value of each to his employer is demonstrated in job competence.

The factors of most concern to management regarding any person in a supervisory capacity may be grouped under these major headings:

Personality: Those factors that have to do with the capacities for working cooperatively with others, such as ability to get along with others, character, and intelligence.

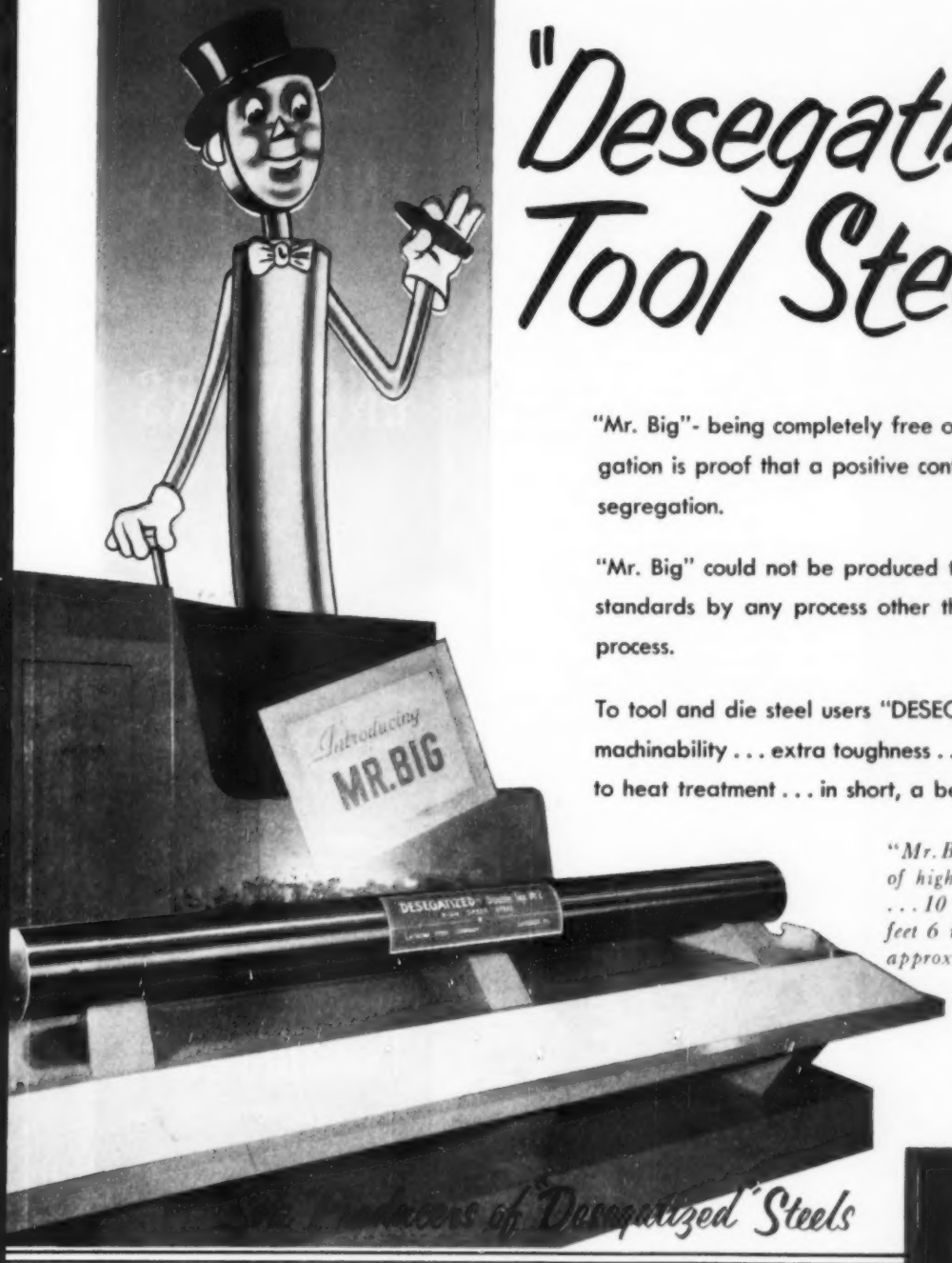
Performance: Traits which bear directly on what the supervisor does on his present job, such as present

"On the other hand, Boss, I've been careful a lot of times when I didn't have to—"

MR. BIG

. . . is proof of the superiority of

"Desegatized" Tool Steels



"Mr. Big"- being completely free of harmful carbide segregation is proof that a positive control exists for eliminating segregation.

"Mr. Big" could not be produced to the same high quality standards by any process other than the "DESEGATIZED" process.

To tool and die steel users "DESEGATIZED" means greater machinability . . . extra toughness . . . more uniform response to heat treatment . . . in short, a better tool or die.

"Mr. Big" is the largest perfect bar of high speed steel ever produced . . . 10 inches in diameter . . . 9 feet 6 inches long . . . and weighs approximately 2600 pounds.

The Producers of "Desegatized" Steels

Latrobe STEEL COMPANY

General Office and Plant: Latrobe, Pa.

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productivity (use of own working time), productivity of unit for which supervisor is responsible, personal efficiency in using own time, and efficiency of unit for which responsible.

Executive capacities: Traits which show the potentialities of growth, such as initiative, organizing ability, leadership, and cooperation.

The foreman-rating plan to be used by management should measure the abilities needed to cope with the imponderables which arise in handling people and unusual events. It should measure how well foremen fill their present positions and call attention to individual weaknesses that can be corrected.

Whether the foreman is judged by his own men or top management, it all boils down to the undisputed fact that an honest appraisal will play a part in making a good supervisor better. When a foreman is rated on his ability to influence others to do good work, on his qualities for inspiring others, leadership and teaching ability, patience and firmness in dealing with subordinates, freedom from prejudices and bias, capacity for teamwork, dependability, willingness to subordinate personal desires, ability to plan and coordinate systematically, and prevention of waste of material, time, and equipment, the results of such a rating plan cannot but be helpful to management as well as the foreman in making him a better supervisor, and in aiding top management to give intelligent guidance to those supervisors in need of such help.

Harry Kaufman
Philadelphia, Pa.

"We've had so many off-and-on strikes we don't know whether we're coming or going."

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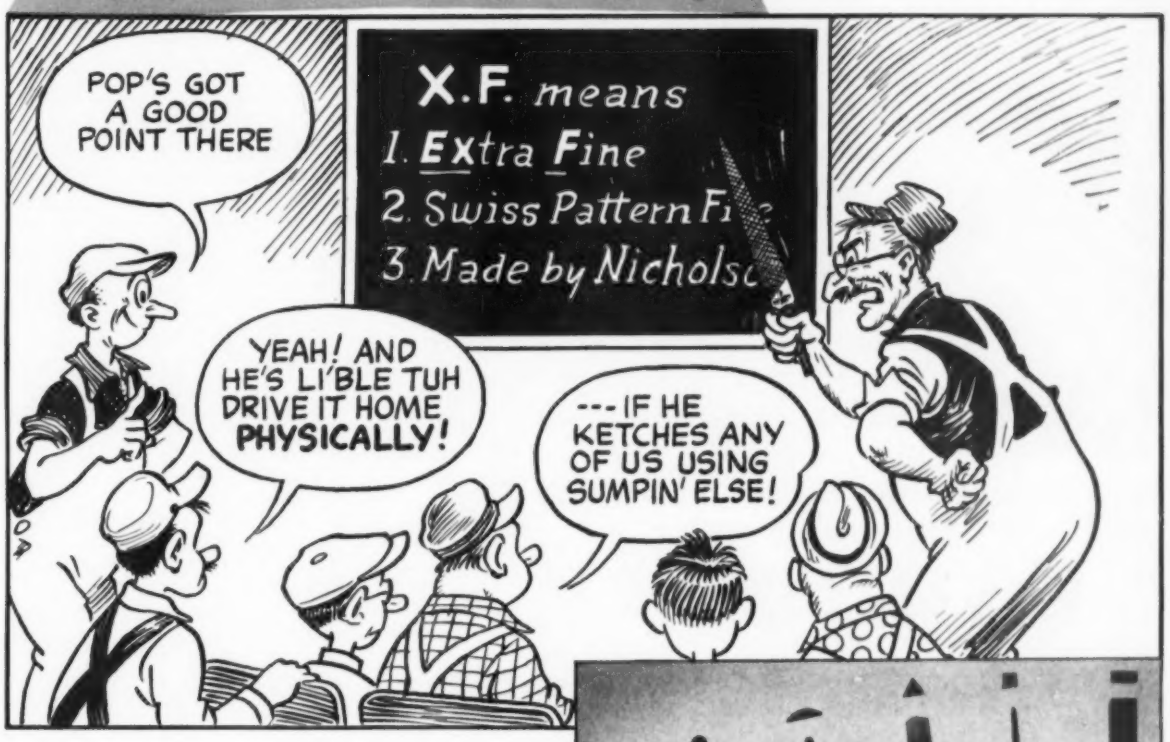
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X.F. means
1. Extra Fine
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3. Made by Nicholso
YEAH! AND HE'S LI'BLE TUH DRIVE IT HOME PHYSICALLY!
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THEY can't put anything over on Pop. He knows (as most good foremen know) that where there's precision filing to be done, there are specially precise files for doing it, viz.: Nicholson X.F. Swiss Pattern Files. He knows, too, that "X.F." means "*Extra Fine*." And for good reason: With 89 years' file-making experience and more Swiss Pattern production than any other manufacturer in America, Nicholson can well be expected to turn out the absolute tops in accurate shapes and cuts and the utmost in quality.

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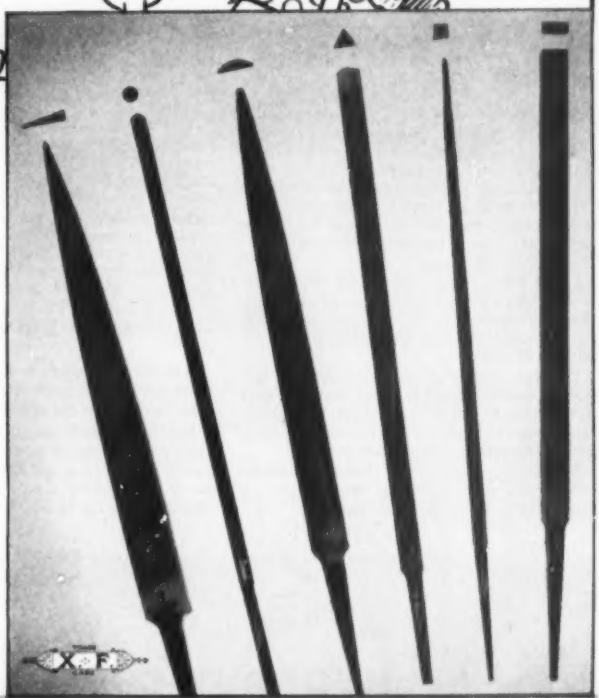

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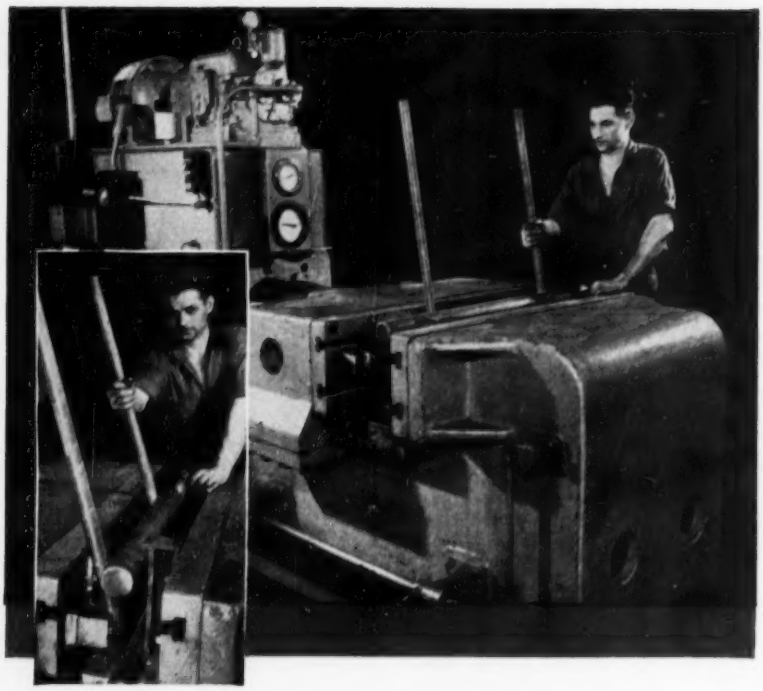

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NEW BOOKS

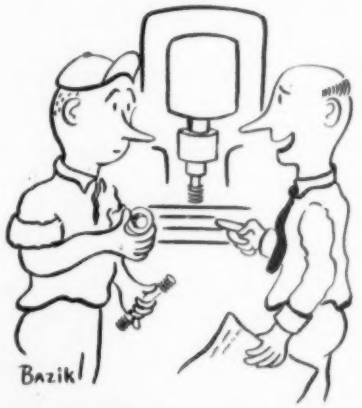
WARNER & SWASEY INSTRUCTION MANUAL FOR 5-SPINDLE BAR AND CHUCKING AUTOMATIC MACHINES. *Published by The Warner & Swasey Company, 5701 Carnegie Avenue, Cleveland 3, Ohio. 243 pages. Price $5. Available to persons in Metalworking for $2.50.*

This is an excellent text for operators, setup men, maintenance men, supervisors, and all those who are concerned with the operation of the specific type of equipment described. Major headings include machine construction, attachments, tooling, and operation. The book is exceptionally well illustrated with both pictures and drawings. An interesting section explains tooling and setup on eight typical jobs that can be run on these machines.

•

DESIGN MANUAL FOR THE REPAIR OF ALUMINUM ALLOY STRUCTURES—*Edited by Howard M Jensen. Published by the Johnson Research Corporation, Bethpage, L I, N Y. 208 pages, plastic spiral binder. Price $3.50.*

Highly illustrated, this book has been prepared with particular emphasis on the repair and maintenance of aicraft structures. Principles however, can be applied to other types of light aluminum alloy construction. The material has been organized to avoid conflict with AN designed parts, descriptions, and procedures. Section I deals with types and analysis of damage; Section II,



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with materials and processes employed for repair; Section III, repair problems and typical examples; Section IV, standard fasteners specifications; and Section V, appendix of tables, formulas, etc. A feature is the large number of well-executed perspective drawings showing exactly how repairs should be made.

•

HANDBOOK OF MANUAL MATERIALS-HANDLING EQUIPMENT — *Published by The Caster & Floor Truck Manufacturers' Assn, 27 E Monroe St, Chicago 3, Ill. 48 pages (8½ x 11, paper bound). Price $1.*

This handbook is intended to provide readers with a comprehensive source of information on all types of manual handling equipment including casters, wheels, hand and floor trucks, and pallets and skids. It briefs the principal things users should know and provides a bibliography for detailed information on specific topics. For each type of equipment, the manual explains types of equipment, how made and applied, and selection principles. Chapters were written and edited by representatives of leading manufacturers of the equipment described. The manual is well-illustrated and explains principles that lead to cost reductions in materials-handling operations.

•

METAL FINISHING GUIDEBOOK DIRECTORY (1953)—*Published by Finishing Publications, Inc, 381 Broadway, Westwood, NJ. 556 pages. Price $3.*

Each year brings a new edition (this is the 21st) of a book that has become invaluable to the practical

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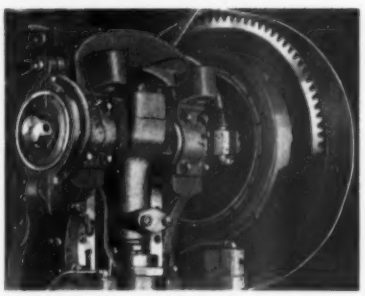

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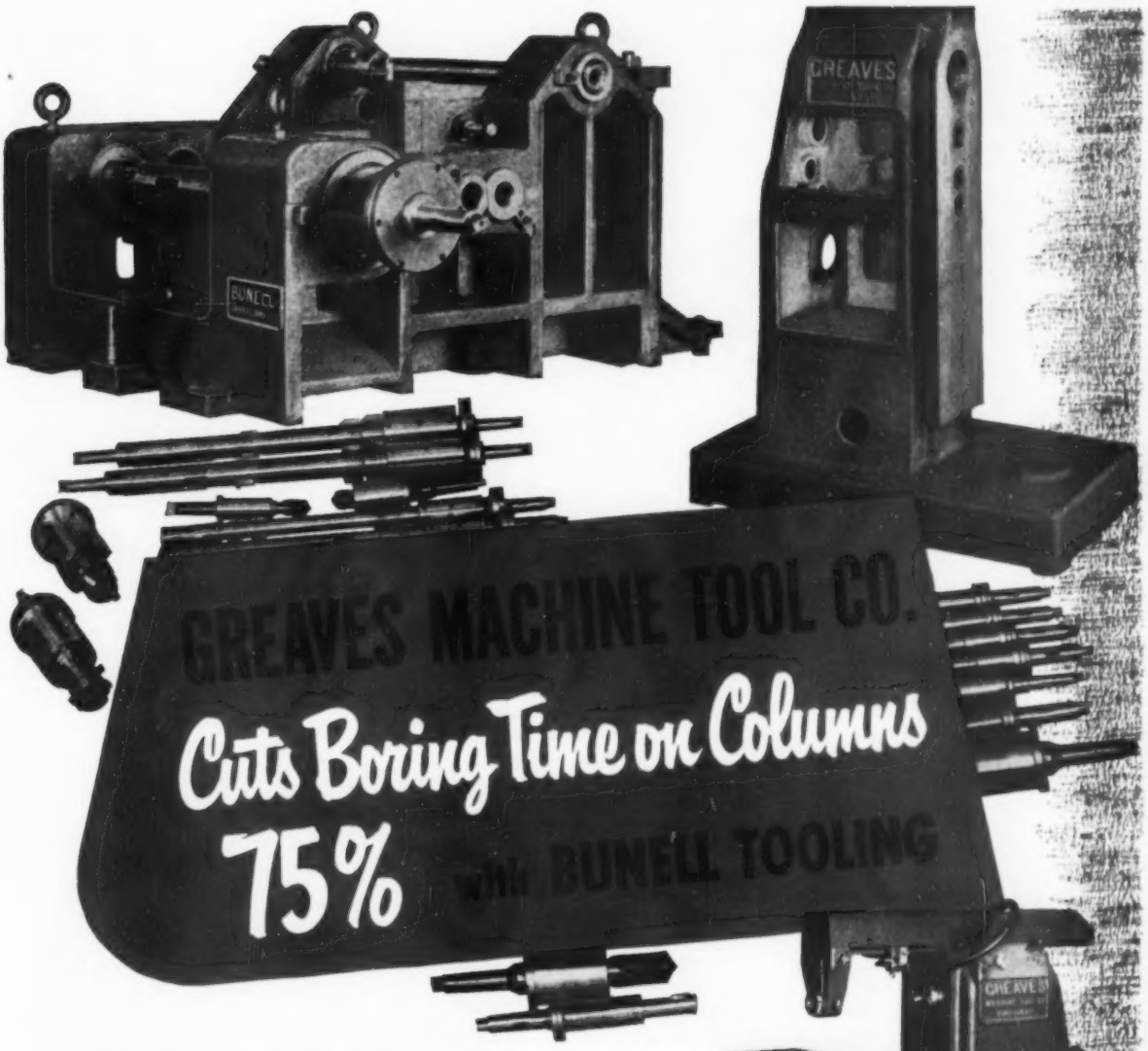

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plater and metal finisher, and a standard reference work for plant engineers in plating and finishing shops, for chemists, purchasing agents, and executives. The basic material is the same as in earlier editions, but there have been several new contributors for the various sections, and the latest developments in techniques and equipment are included.

•

STATISTICAL QUALITY CONTROL (2ND EDITION)—*By Eugene L Grant, professor of economics of engineering, Stanford University. Published by The McGraw-Hill Book Co, 330 W 42nd St, New York 36, N Y. 557 pages. Price $6.50*

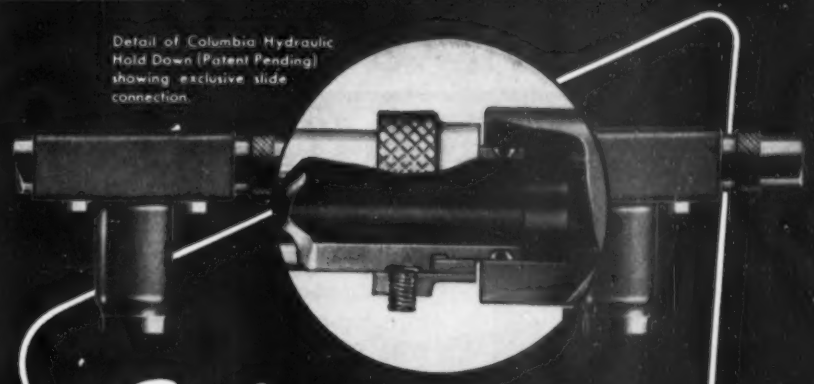
Major changes in this widely accepted text include additional material on acceptance sampling, both by attributes and by variables, double the number of problems, master tables from "Military Standard 10.5A—Sampling Procedures and Tables for Inspection by Attributes," and new material on the cost aspects of quality decisions. Multiple and sequential sampling plans are discussed and procedures used by the military services are covered. Variables tables and procedures recently developed under the direction of Dr A H Bowher also are described.

•

PRINCIPLES AND METHODS OF SHEET-METAL FABRICATING—*By George Sachs, Vice-President, Horizons Inc, Cleveland, Ohio. Published by Reinhold Publishing Corp., 330 W 42nd St, New York 36, NY. 526 pages 6x9 in. Price $11.*

This reference book is based, to a considerable extent, upon the re-

"Boy! What a joint we work in . . . old tools . . . old presses . . . nuthin' new!"



Detail of Columbia Hydraulic Hold Down (Patent Pending) showing exclusive slide connection.

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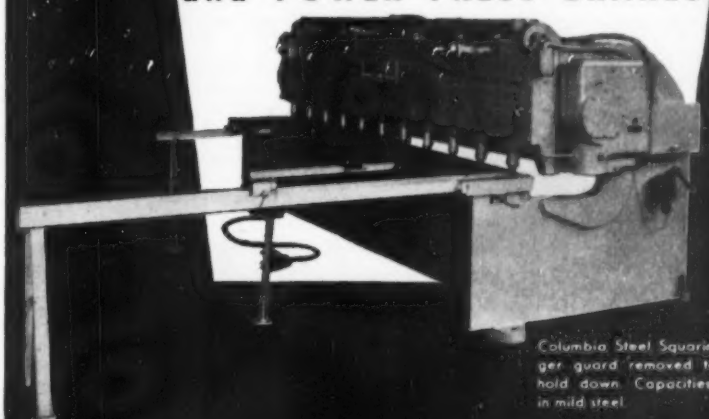
Write for our Bulletin 5229, and the address of a nearby representative qualified to assist with your metal shearing and forming problems. Address your request to Columbia Machinery and Engineering Corporation, Hamilton 2, Ohio

new series Columbia STEEL SQUARING SHEARS and POWER PRESS BRAKES



Columbia Steel Squaring Shear with finger guard removed to show hydraulic hold down. Capacities 3/16" to 1¼" in mild steel.

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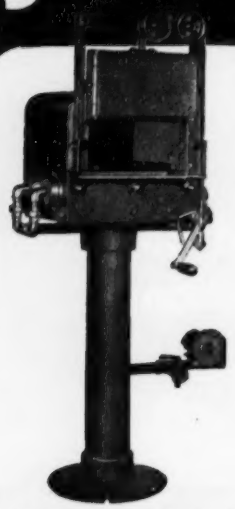

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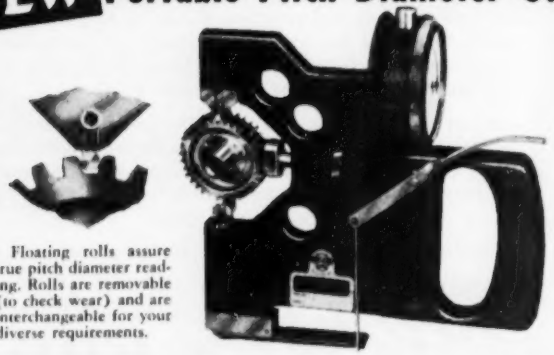

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sults of investigations by the United States Government on the unusual forming properties of new alloys and on similar work sponsored by the International Nickel Co to facilitate the fabricating of austenitic stainless steels. It systematically describes the principles of numerous sheet-metal forming methods and emphasizes their similarities and differences.

The theory of deformation of sheet-metal and tubing is covered as is the metallurgical effects produced in stamping, drawing, extruding, bending, and others. In addition, the practical operations involved in this work are included—design of parts and dies and the production equipment used. Numerous examples of commercial work are analyzed for easier understanding of how specific jobs are done.

•

THE DEVELOPMENT OF EXECUTIVE TALENT—*Edited by M Joseph Dooher and Vivienne Marquis, American Management Association. Published by the American Management Association, 330 W 42nd St, New York 36, N Y. 576 pages. Price $5.75 to members, $6.75 to others*

Principles and tested practices underlying sound executive training and management development are presented in this manual. Sections discussing all phases of planning and administration from analysis of needs, through the discovery of latent executive ability, to inventorying, rating, and development of executive skills were prepared by 44 recognized authorities in the field.

"Wiseguy! I told you not to use fans around here!"

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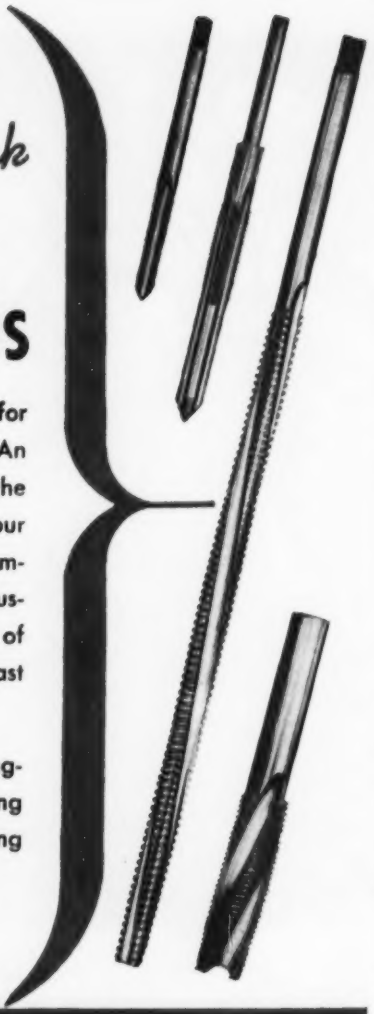

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With a Boston Universal Angle Plate on the job, work is quickly set up on the table and but a few seconds are required to locate it at the desired angle. Indispensable in tool rooms and extremely useful in production runs, the Boston Universal pays for itself many times over by eliminating the necessity of expensive jigs and fixtures.

Horizontal motion is 360 degrees; vertical motion, 120 degrees. Fitted with vernier scale reading to 5 minutes.

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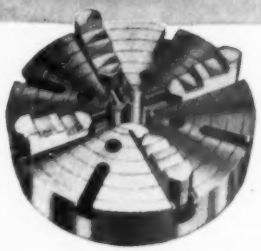
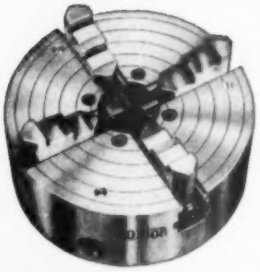


quality

performance



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While step-by-step solutions to specific problems are not given, the methods employed under a variety of conditions are explained. These provide practical guidance for managements introducing new programs and for those who write to improve existing procedures. In adition, one section describes in detail programs now in operation in 18 leading companies, including forms used for inventorying, rating, and other techniques of executive development.

Consisting of 50 chapters, this text is divided into nine parts. Subjects covered include: setting up the program; organization planning; putting the program into action; special approaches, techniques, and programs; getting results from follow-up counseling; program evaluation; trends in management development; and case studies.

•

CONVEYOR TERMS AND DEFINITIONS—*Prepared by the Conveyor Equipment Manufacturers' Association, 1 Thomas Circle, Washington 5, D.C. 64 pages, 8½x11, paper bound. Price $1*

This manual was prepared in an attempt to eliminate the confusion that exists generally in discussing and specifying conveyors. It provides uniform nomenclature and definitions that can be applied both by users and equipment manufacturers. These were prepared by the Technical Committee of The Conveyor Equipment Manufacturers Association and were written so each can be clearly understood and will have the same meaning to all readers. Each type of conveyor is defined by what it "is" rather than by what it "does." A number of illustrations are included. Short sections describe the conveyor industry and the Conveyor Equipment Manufac-

"We prefer to run the coke machine to the men, rather than have them waste time running to it!"

OVER ONE HUNDRED YEARS OF CONTINUOUS SERVICE. ROUNDS, SQUARES, FLATS, HEXAGONS, OCTAGONS

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OIL HARDENING TOOL STEEL

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WL steels are metallurgically constant. This guarantees uniformity of chemistry, grain size, hardenability – thus eliminating costly changes in heat treating specifications.

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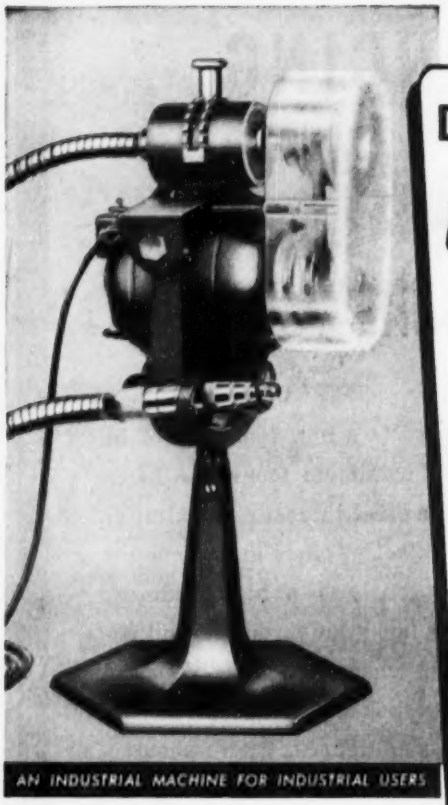

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EASIER-FASTER
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FLEXIBLE SHAFT MACHINES

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Whether your operations call for GRINDING, CUTTING, BUFFING, or ROTARY FILING, Jarvis Flexible Shaft Machines will do your jobs Easier—Faster and more economically.

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Jarvis Factory trained representatives are ready to assist you select the Machines you need. For further information and Catalog of Jarvis Flexible Shaft Machines, write directly to The Charles L. Jarvis Company, Middletown, Connecticut.

Jarvis POWER TOOLS

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turers Association. A list of member companies is included.

The manual represents a big step forward in the solution of a common problem. It can be applied to advantage by all users of conveyor equipment.

•

THE WORLD OF ELI WHITNEY—*By Jeannette Mirsky and Allan Nevins. Published by The Macmillan Co, 60 Fifth Ave, New York 11, N Y. 346 pages. Price $5.75*

Eli Whitney invented the cotton gin! Eli Whitney was the father of American interchangeable manufacture! Thus, in two bald statements, history dismisses a man who surely deserves a place among the immortals; with Edison, Colt, McCormick, and Maudsley.

Who was he? What was his background: His family? And what did a Connecticut Yankee know of the difficulties of ginning greenseed cotton, a plant grown on but a few acres of Georgia soil?

This new book gives the answers and tells, for the first time, the whole story of Whitney's life, his struggles, hopes, and disappointments. Here are his letters to his father, sister, and close friends. Here is the shocking story of Georgia courts dismissing his suits for patent infringement, even jailing him on trumped-up charges. And here is the record of his courageous and finally victorious battle to sustain the rights, not only of himself, but of all inventors who should come after him.

There are no direct words of praise, yet the record is so clear that the reader cannot but admire the

"Ha—you shouda seen the one that got away!!"

genius that dared to contract with the government for thousands of muskets, without a plant, a machine, or an employee. As the story unfolds, a now-familiar picture takes form—plant construction, development of special machines, the long and tedious job of tooling, the cash-consuming months of non-productive effort, and finally, the steady flow of identical muskets pouring daily from a busy plant.

It is not a book to be skimmed through lightly—it is too crammed with facts for that—but it is one to be read carefully, line by line, and laid aside regretfully. It merits a place on every library shelf.

•

WELDED HIGHWAY BRIDGE DESIGN—*Edited by J G Clark, University of Illinois. Published by James F Lincoln Arc Welding Foundation, Cleveland 17, Ohio. 240 pages. Price $2 in U S A, $2.50 elsewhere.*

Presenting significant designs and details of welded bridges submitted in the Lincoln Foundation's award program, this new book discusses structural types, floor systems, new sections, connections and details, quantities, and cost. Over 100 illustrations are included.

The designs are for an all-welded, two-lane, through highway bridge with a span of 250 ft, and were submitted by recognized consulting engineers, structural engineers with government departments, designers of steel fabricating companies, structural engineers of research organizations, and professors of structural engineering from 17 different countries. Major features of enough of the designs are presented to insure that most of the new, important, and useful information is included.

ASME MECHANICAL CATALOG AND DIRECTORY 1953—*Published by the American Society of Mechanical Engineers, 29 W 39th St, New York 18, N Y. 680 pages, size 8½ by 11⅛ in. Distributed to ASME members only, no charge.*

This 42nd annual catalog and directory is a reference for materials, processes, manufacturers, tradenames and ASME publications. Set up in four sections, the single-volume book contains:

1. Catalogs arranged in alphabetical order covering hundreds of items used in industry for manufacturing and maintenance
2. A directory indicating the source

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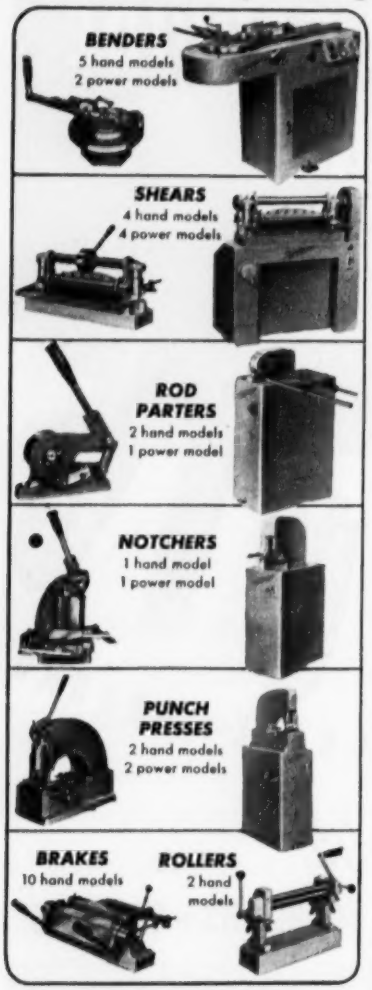
PRECISION MACHINES
for Die-less Duplicating



NEW CATALOG
packed with ideas for making parts by "Die-less Duplicating"—the money-saving, time-saving technique created by Di-acro.

BENDING MANUAL
gives exact methods for bending processes in a variety of materials. Over 90 diagrams and charts with suggestions.

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of additional equipment, machinery, and supplies needed by the mechanical engineer. A practically complete index to firms serving the field is supplied by this section

3. An alphabetical list of trade names supplied by the firms listed—a useful aid when only a key word is remembered in searching for device or material

4. This section is a 20-page insert catalog covering ASME codes, standards, periodicals and other ASME publications

The Future of Automation

"At the Ford Motor Company, we feel that automation is an important 'in process' material-handling tool and that it is the missing link which assists us in obtaining the maximum usefulness from our tremendous capital investment in machine tools and process equipment. It is a must in the industrial picture of today and the future."

Speaking at the 4th Biennial Materials Handling Conference, John McDougall, manufacturing staff, Ford Motor Company, then continued:

"The future of automation, to a great extent, lies in the hands of top management, and the manufacturers of machine tools, material handling, and process equipment.

"If the following program is carried out, the future of automation will be assured:

1. Continue to develop machine tools, material handling, and process equipment, taking into account the full significance of automation.
2. Develop closer coordination with the purchaser of machine tools and equipment.
3. Closer cooperation among the various builders of machine tools and equipment.
4. Spread information on the subject to groups not now actively working on automation as a definite program.
5. Develop additional sources for the design, building, and installation of automation.

"There are several industries in the country today, which are completely automatic. The future will certainly find more. A trend has developed; the possibilities are clear. It is a matter of continued and increased management attention, engineering study, and coordination to keep the trend going and to extend it for the benefit of all."

•

Check These Points When You Plan Automation

Both sides of the picture should be considered in analyzing operations for the application of automation, according to John McDougall, manufacturing staff, Ford Motor Company, in a speech at the 4th Biennial Materials Handling Conference.

McDougall listed as advantages for automation:

"1. Lower production costs by re-

WHAT A BOMBARDIER HE'D MAKE IF HE WAS ONLY FORTY YEARS YOUNGER!
THE BOYS IN THE INSPECTION ROOM WILL JUST LOVE THAT CONSIGNMENT!
OUR ONE MAN CONVEYOR SYSTEM IS BACK IN ACTION AGAIN!
TRAVEL CERTAINLY LIGHTENS HIS LOAD!
HERE COMES THE REASON FOR SAFETY SHOES!
DROPSY JOE, HE THINKS PUSHING A TRUCK WOULD BE DOWN GRADING!
LOU MORTISON

Shaper Chips steps up the transportation system.

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good judgment calls for

PARKER-KALON®

when good design calls for

SOCKET SCREWS

DELIVERIES ARE BETTER CHECK WITH P-K FIRST

Your P-K DISTRIBUTOR *has good news. His stocks of P-K Screws are steadily improving. The size and type you need may now be readily available. Ask about it. Remember— "If it's P-K . . . it's O.K."*

Whether you make simple jigs and fixtures or giant machine tools, assembly with P-K Ground Thread Socket Set Screws will reflect superior construction throughout. Any buyer associates topmost quality with their super-smooth, gleaming *ground thread* finish.

This sales-feature is only one advantage. Assembly moves faster, too. Workers like their clean, burr-free contour, their easy keying, their dependable Class 3 Tolerance.

Ask for samples. See why P-K Ground Thread Socket Set Screws will put your product out in front, assembly-wise and sales-wise. Parker-Kalon Corporation, 200 Varick St., New York 14.

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Producers of fine tool steels—High Speed Steels Die Steels—Hot Work and Shock Resisting Steels Carbon Tool Steels.

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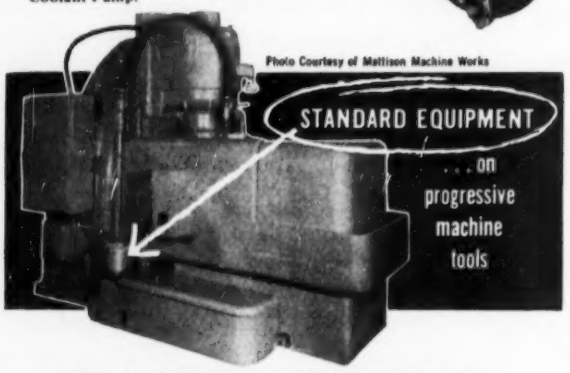
RUTHMAN GUSHER Coolant Pumps

Your *Gusher* Coolant Pump is scientifically designed and precision built by experts to give you an efficient, trouble-free, and long lived coolant pump.

The leading machine tool manufacturers know this from experience. That's why they use Gusher Coolant Pumps as standard equipment on their machines.

The Mattison Machine Works #24 Rotary Surface Grinder illustrated is equipped with a ½ HP Gusher Coolant Pump.



THE RUTHMAN MACHINERY CO.

1818 Reading Road, Cincinnati, Ohio

ducing the manual handling of parts. This does not mean elimination of all manpower, but rather, a redistribution of manpower. Much less unskilled labor will be required, but a greater number of skilled operators will be needed to maintain equipment and change tools.

2. Greater production per machine by eliminating inherent delay in the loading and unloading cycles. Machines or equipment are run virtually at full speed 100% of the time, not considering normal maintenance downtime and tool changes.

3. Increased quality of each part manufactured by reducing the damage caused by parts striking each other.

4. Safety is increased to a high degree by elimination of hazardous handling of such parts as stampings, forgings, and large engine parts, and in heat-treat operations.

5. Reduction of manpower fatigue by using simple interlocked electrical controls to make the decisions and employing mechanical devices to do the actual labor.

Disadvantages were stated by McDougall as:

"1. Maintenance costs are always brought up when discussing handling equipment that must be fully automatic. We have found that we must consider maintenance as a decided disadvantage. However, as skill in automation design has increased, the details of the systems have been simplified, and construction has become more rugged. Preventive maintenance must be practiced.

2. Additional engineering costs must also be considered, due to the need of close coordination of so many elements such as Plant Layout, Processing, Tool & Die Design, Machine Tool and Material Handling, etc. Much careful planning is necessary and many design hours are required before construction may start.

"—Are you working here or just grounded by bad weather?"

This new booklet shows you how Kodak Contour Projectors can simplify your inspection and measurement problems

Just off the press is the most informative booklet on Kodak Contour Projectors we've ever published.

- It shows by example and case history how you can inspect large parts, small parts, long parts, curved parts, delicate parts, complex parts, all sorts of parts on the Kodak Contour Projector.
- It gives details of both the Model 2A for precision micrometry, and the Model 3 for fast, routine gaging.
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- It lists the accessories that extend their versatility.
- It discusses the measuring attachments that provide critical accuracy.

Whether your interest lies in toolroom measurement or production assembly and inspection, Kodak Contour Projectors will do the job quickly, completely, and accurately with little training of operators. For complete details, send for your complimentary copy of this new 12-page booklet. Just write to Eastman Kodak Company, Industrial Optical Sales Division, Rochester 4, N. Y.

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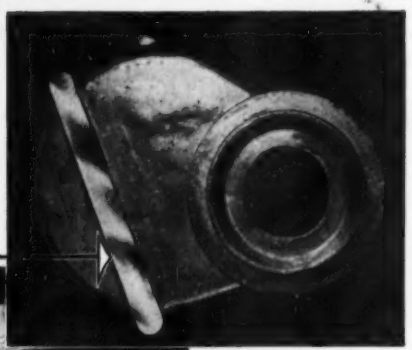
Optical Gaging

A new sound movie, Optical Gaging, shows how to simplify complex inspection problems. We'll tell you how to get it for a showing.

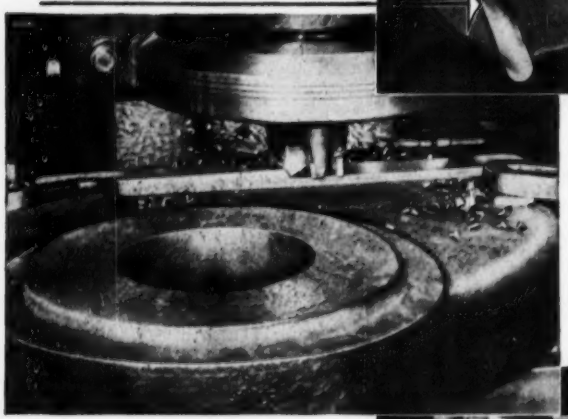
Kodak

CUTS ARMOR PLATE LIKE BUTTER

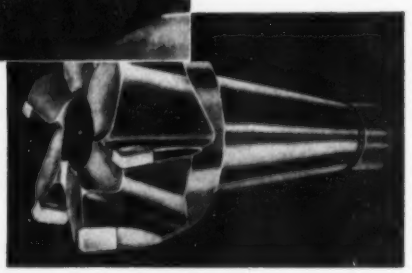
PHENOMENAL END MILL PERFORMANCE ON BULLET-PROOF TANK ARMOR PLATE



PROBLEM: MILL 23½" x 2¼" SURFACE OF TANK CARRIER!
The material – the toughest armor plate casting yet devised for military purposes! An impossible operation with other types of cutters tested.



SOLUTION: STOCK REMOVAL ⅜" to ½" IN 3 CUTS – Finished surface parallel within .002 – NO REJECTS! A smooth machine like finish at 10½" per minute.



AND HERE'S THE NELCO TOOL THAT SOLVED THIS VITAL DEFENSE BOTTLE NECK!
The *rugged* virtually *indestructible* NELCO Taper Shank End Mill – A 4" carbide tipped cutter that literally chews away half an inch of the toughest alloy Armor Plate America has produced – leaving a smooth, accurate machine-like finish.

Another of the *impossible* machining problems solved by NELCO tools and the Engineering advice of NELCO Field Engineers. Nelco cutters not only *save money* – they *make money* by performing costly machining jobs in newer ways – better ways!
Write for catalog and details on this husky NELCO TAPER SHANK END MILL and the hundreds of other NELCO Engineered Carbide Tools.– TODAY!

NELCO TOOLS *For that Extra Edge in Production*

NELCO TOOL COMPANY, INC., MANCHESTER, CONNECTICUT

3. Installation costs are inherent with all equipment. However, a problem occurs when existing operations are studied and automation is found necessary. Rearrangement of large machinery and equipment can be very costly when done to suit automation. When this occurs, justification of moves must be dictated by advantages gained.
4. The specialized nature of equipment is another disadvantage. Every part that we study requires special consideration, because of its size and shape. Another problem along this line is the varied load and unload stations of machines in the layout. This problem has been greatly minimized on new programs through closer coordination of all phases and proper planning when the layout is made.

"It is very important to know these disadvantages when analyzing a problem for the application of automation." However, they ". . . are gradually being eliminated by our accent on design simplicity" (See "Latest Improvements in Automation at Ford," *AM*—Dec 8 '52, p109.)

•

Materials Handling Added to Management Training

ESTIMATED SAVINGS of $130,000 from a new program for training supervisors in materials handling were reported by R W Mallick, staff engineer, Westinghouse Electric Corporation, at the 4th Biennial Materials Handling Conference.

"For many years," Mallick said, "it has been a Westinghouse policy to provide specialized training for all levels of management personnel. This training is arranged to enable supervisors and specialists to obtain

"This clipping is old: 'Jet engines will be easily mass produced; simple design permits very wide tolerances'."

IT'S RESULTS THAT COUNT!

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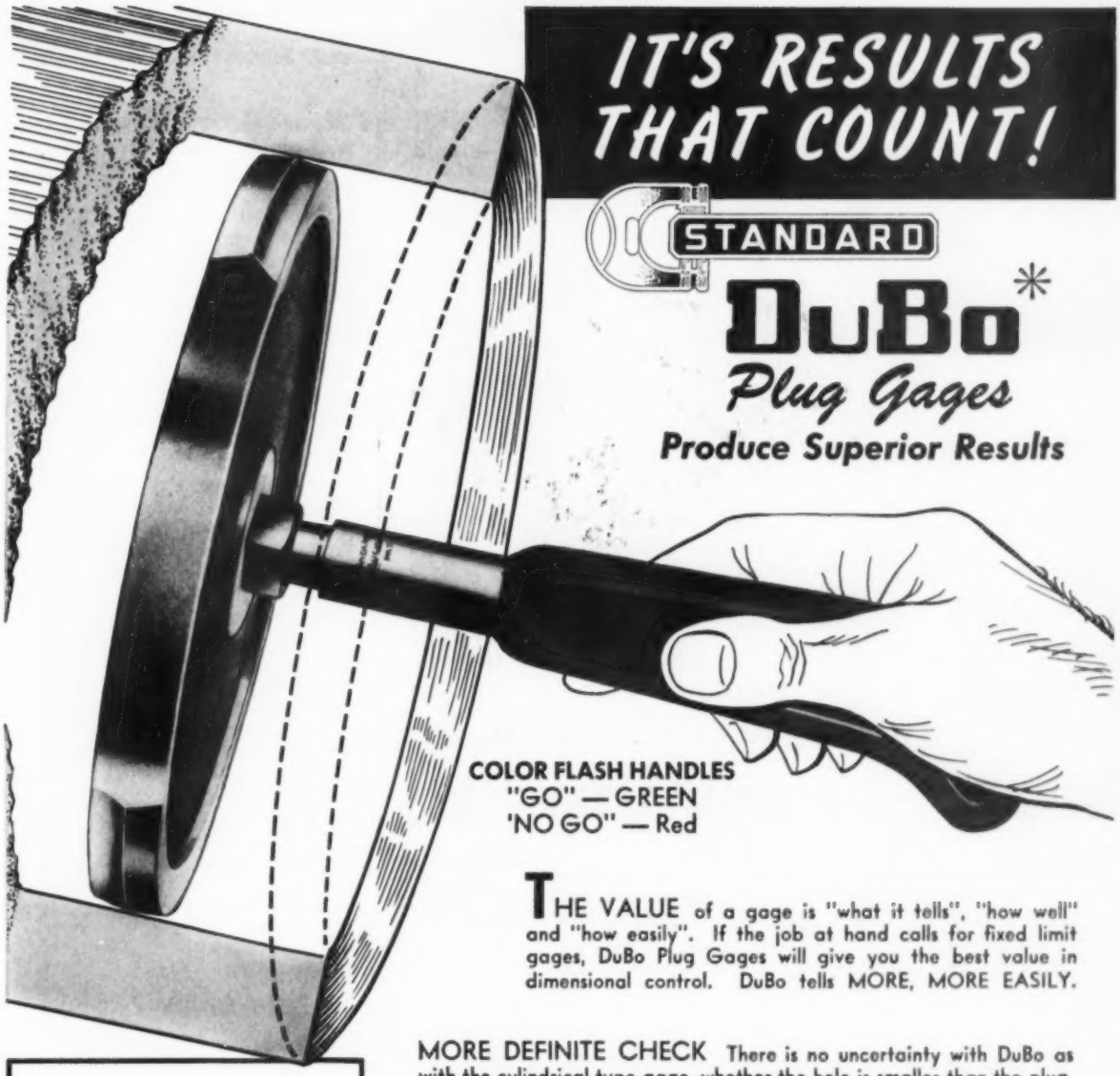
DuBo*

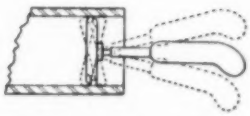
Plug Gages

Produce Superior Results



COLOR FLASH HANDLES
"GO" — GREEN
'NO GO" — Red

THE VALUE of a gage is "what it tells", "how well" and "how easily". If the job at hand calls for fixed limit gages, DuBo Plug Gages will give you the best value in dimensional control. DuBo tells MORE, MORE EASILY.



Operates by Tilting Handle

Whether handle will drop freely or not is the definite yes-or-no indication. No guesswork, no forcing, no fumbling!

MORE DEFINITE CHECK There is no uncertainty with DuBo as with the cylindrical type gage, whether the hole is smaller than the plug, or larger and merely close. DuBo not only checks dimensional accuracy but also reveals taper and out-of-roundness. DuBo reduces the number of parts needlessly rejected or improperly passed.

EASIER OPERATION The DuBo Plug Gage weighs from 70 to 80% less than cylindrical plug gages of the same dimension. It is self-piloting, no trouble at all to enter. A "feather touch" is all that is needed for operation. See diagram at left.

LONGER LIFE Gaging surfaces of the DuBo contact the bore walls only at the instant of making the check. DuBo gives you effective, economical gaging.

Double end DuBo Plug Gages Under 1.510"

Single end DuBo Plug Gages Over 1.510"

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STANDARD GAGE CO., Inc., Poughkeepsie, N.Y.

MEASURE IN MICROINCHES RMS

RING CHECK *reduces* REJECTS

when THE FEDERAL BEARINGS CO., Inc.

uses the PROFILOMETER

The Federal Bearings Co., Inc., of Poughkeepsie, New York, is one of the country's largest producers of precision ball bearings. As a manufacturer who produces the finest in bearings, it is essential that all raceways of the inner and outer rings comprising a Federal bearing have an extremely fine surface finish.

To check the surface finish of such rings during manufacture and before final assembly, Federal relies on the Profilometer as an essential part of their production process.

Federal, previous to the adoption of the Profilometer, checked surface finish visually; and after assembly tested for smoothness of operation under pressure run-out. Due to the exacting standards which the company maintains, this method often slowed production due to surface finishes. With the adoption of the Profilometer, however, surface finish of the bearing rings is now checked *before* final assembly. Result—precision quality control of bearings at all times during manufacture and a minimum of rejects prior to final bearing assembly.

This is just another example of how industry today is using the Profilometer in production processes as an important shop instrument.

To learn how the Profilometer can help cut costs in your production write today for these free bulletins . . . Practical Operating Features of the Profilometer; Your Needs in Roughness Measurement.

Profilometer is a registered trade name.

MICROMETRICAL
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more "know-how" which can be used to improve their own performance. In most instances, participation in these training programs is voluntary. The Company pays all the costs, and most of the training is done during regular working hours.

"This year a new course was added to those already available, and it deals with material handling. The first group to take the course was selected by management, and participation was by appointment. This was done to obtain representation from all departments in the plant.

"The results were very gratifying. Each participant was required to undertake an actual project in his department. These projects were then evaluated. Twenty-seven projects were recorded and the estimated savings upon completion were $130,000. About half the projects have now been actually completed and verified savings reported to date are in excess of $58,000.

"Arrangements have now been made to continue the course as a part of the regular curriculum on a voluntary participation basis. It will also be extended to other plants of the company.

"In conjunction with the training program we produced a sound slide film entitled "Hands Off." This film shows case examples of various material handling improvements made by the Pittsburgh divisions of the company. It is shown to various groups of supervisors all over the company and to the participants of the training course."

•

Better Handling Pays off $2800 per Project

"ONE OF THE most effective weapons in combatting material-handling costs is the Material Handling Improvement Program," according to R W Mallick, staff engineer, executive department, Westinghouse Electric

"Oh, Chief, I think I've located your chair."

The New – ARTHUR KLINK

HYDRAULIC

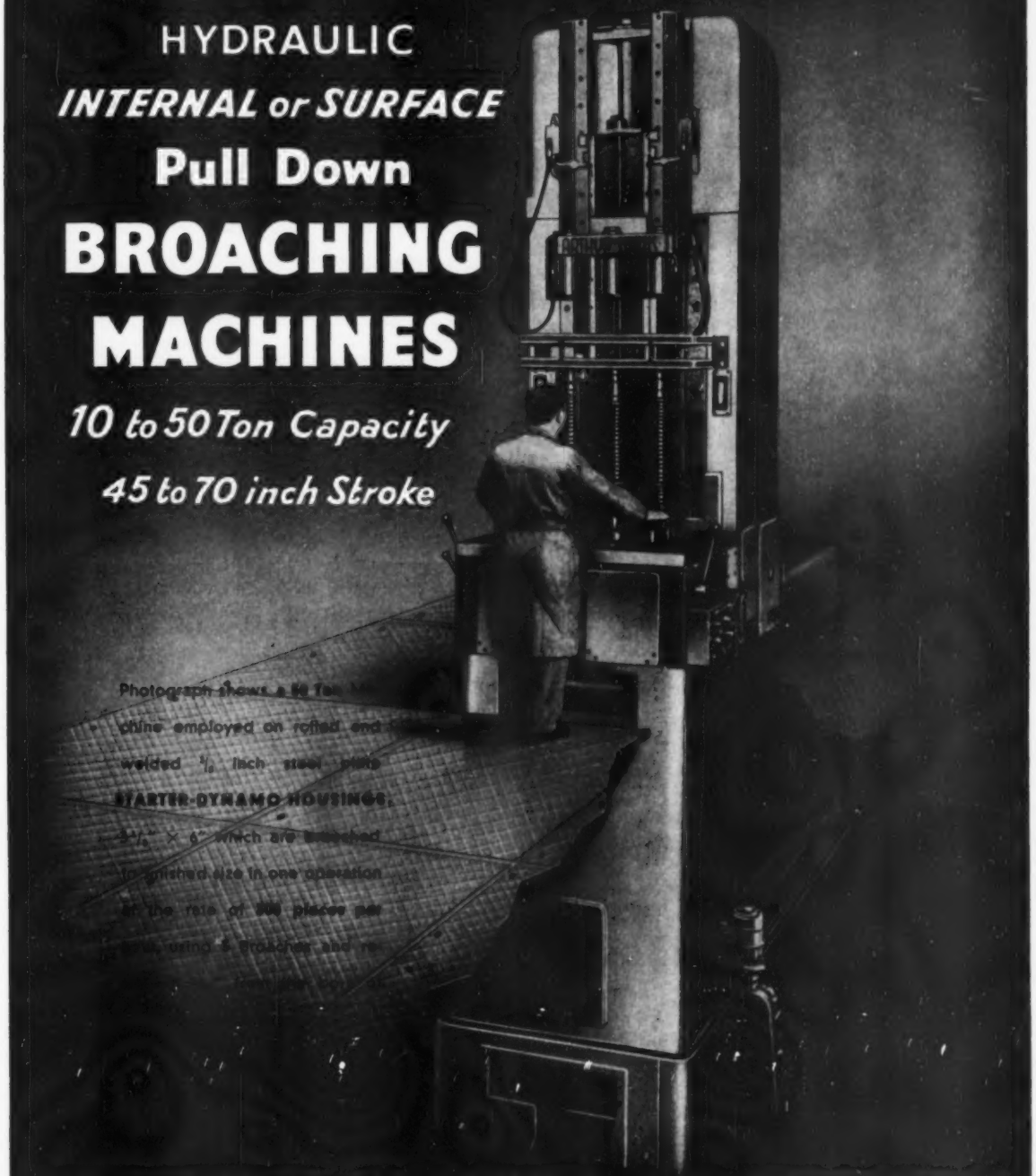
INTERNAL or SURFACE

Pull Down

BROACHING MACHINES

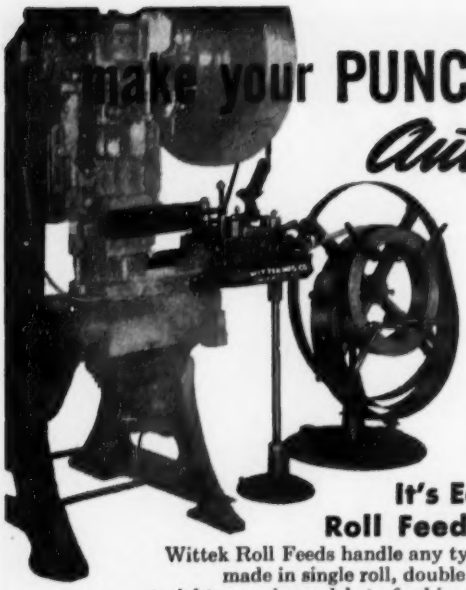
10 to 50 Ton Capacity

45 to 70 inch Stroke



BROACHING MACHINES AND BROACHES

ARTHUR KLINK G.M.B.H. NIEFERN BADEN - GERMANY



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Wittek Roll Feeds handle any type of coiled strip stock and are made in single roll, double roll, and compound types with straighteners, in models to feed in any of four directions. They are reliable and accurate with simple, quick adjustment of feed length. Standard sizes and models meet a wide variety of press size and capacity conditions.

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Wittek Reel Stands facilitate handling coiled stock.

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Automatic ROLL FEEDS AND REEL STANDS

WRITE FOR "THE STORY OF METAL SPINNING." Find out how engineers design for lower costs; how to use the Teiner experimental shop and how Teiner provides all-gauge — all-metal — any-quantity spinning for industry. Read about this spinning shop, now largest in the east and tops in scientific experimental spinning. ***Ask for Brochure 52A***

ROLAND TEINER COMPANY, INCORPORATED

134 TREMONT ST., EVERETT 49, MASS. Tel EV 7-7800

ROLAND TEINER CO. INC. METAL SPINNING

Corporation. Speaking at the 4th Biennial Materials Handling Conference sponsored by Westinghouse, Mallick explained that the program "is essentially a cost-reduction program, conducted by the operating personnel, aimed at reduction in costs, elimination of accident hazards, better housekeeping, and general improvement of working conditions.

"The general theme of such a program is to convince the shop supervisor that he is the key man in recognizing material-handling problems in his area. He must understand how to spot problems and what to do about them, but he does not have to be a material-handling specialist. However, he must be a good watchdog and must take appropriate action to set the machinery into motion to bring about corrective measures. These programs pay off handsomely, as proved by an East Pittsburgh division that realized an average annual savings in labor and material of $2800 for each project actually completed."

•

Electronic Dispatcher to Control Conveyors

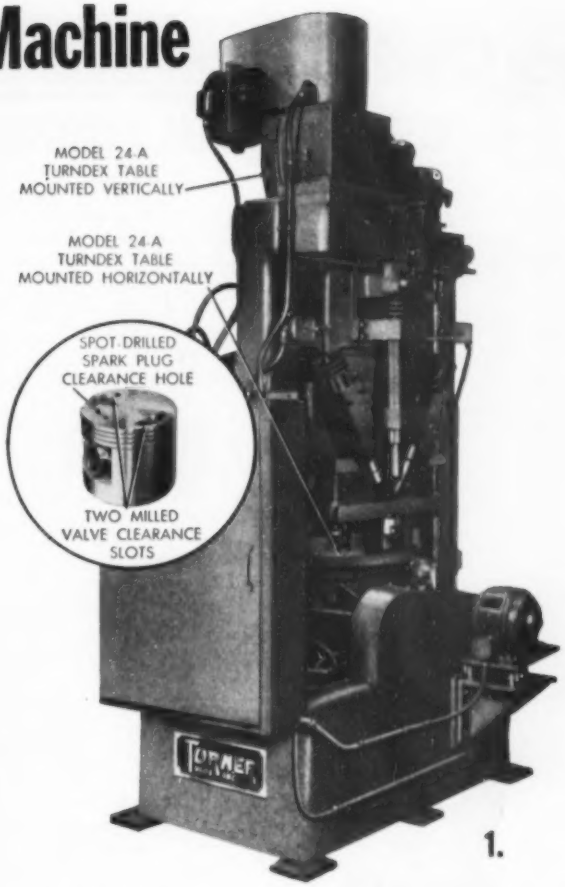
"THE USE OF resonant pickup coils and oscillators to provide dispatching signals on materials-handling systems," was predicted recently by Stephen W Jessop, chief estimating and designing engineer, Jervis B Webb Co, in a talk at the 4th Biennial Materials Handling Conference sponsored by Westinghouse Electric Corporation.

"By controlled radio frequency, a selector box on a truck or carrier will open the designated switch. Memory devices comprised of magnetic tapes on wire bands, with signals placed on them by a dispatcher with a pushbutton-station console, will direct traffic for materials-handling systems. We are, at present, completing experiments on stacked, tuned condensers used in the station selector box, and resonant-reed relays to pick up the signal of two shoes on two wipers for as many as 100 selections with a small selection package and a low maintenance operating package.

"Ninety percent of the units designed for control operations are made up as a package with plug-in connections to junction boxes so components may be replaced. A complete package can be installed and the components repaired or maintained in the maintenance department on a bench."

Split-second Indexing Machine

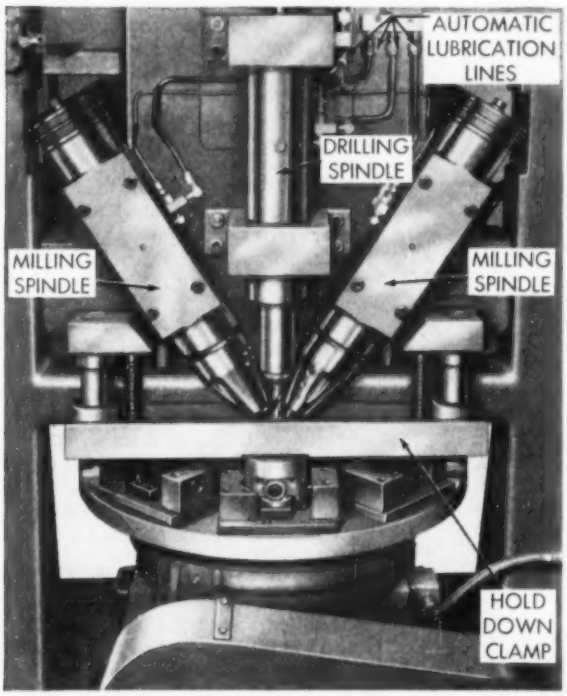
Mills and spot drills 700 pistons per hour


MODEL 24-A TURNDEX TABLE MOUNTED VERTICALLY
MODEL 24-A TURNDEX TABLE MOUNTED HORIZONTALLY
SPOT DRILLED SPARK PLUG CLEARANCE HOLE
TWO MILLED VALVE CLEARANCE SLOTS
TURNER

1.

This special piston milling and spot drilling machine was designed and built for one of the large automobile companies by Turner Bros., Inc., Ferndale, Michigan. This machine utilizes two Model 24-A Hautau-Turndex Automatic Indexing Tables. One of these Turndexes is mounted on top of the machine in a vertical position and is used to actuate the slide on which are mounted the milling spindles, drilling spindle and hold down clamp (Picture 2).

This vertically mounted Hautau-Turndex causes the cutting spindles to make a split-second approach to the work, feeds the cutting tools into the work, and when the operation is completed, the heads are rapidly returned by the Hautau-Turndex.



2. *View shows working side of machine with piston being milled and drilled.*

The horizontally mounted indexing table is located in the base of the machine (Picture 2) and has six spring loaded fixtures for ho'ding the part to be machined.

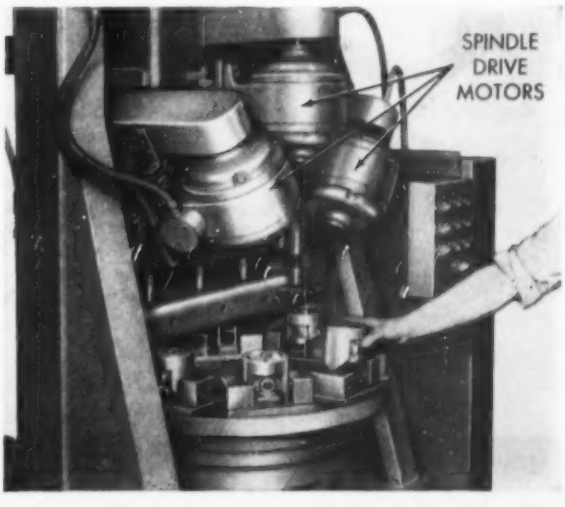
Loading is done on the opposite side of all cutting operations, thereby affording complete safety for the operator (Picture 3). The push button station (Picture 3) allows operator to perform manually each operation separately such as feed actuation, index of fixtures or operation of any work spindle as well as automatic operation.

Another feature of this Turner machine is that, should any failure occur in any operation of the machine, the automatic safety shut-off will stop the machine immediately. Until the error is corrected, the machine cannot be restarted.

The tools for this Turner machine are set with a master piston gage that is hardened and ground to simulate the actual piston. The electrical work is built to J.I.C. Standards, and all drives are separate and all motors and heads are readily accessible for repair or replacement.

This Special Turner Indexing Machine produces 700 parts per hour and production is limited only by the fact that the operator cannot load the pieces any faster.

If you have time consuming machining operations on which you would like to save on manpower, inspection time and floor space, why not write Turner Bros., Inc., 2625 Hilton Road, Ferndale 20, Michigan, describing your problem?



3. *Operator loads machine in complete safety on opposite side of cutting operations.*

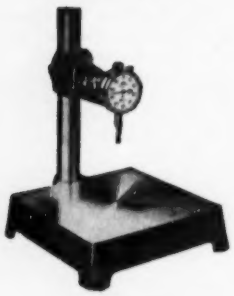
FOR *Strictly* IMPERSONAL INSPECTION CHOOSE AMES DIAL COMPARATORS

Ames Dial Comparators make the inspection of duplicate parts an extremely simple, rapid and accurate operation. Ames Comparators are strictly impersonal in their accuracy — the results being in no way dependent on the skill or judgment of the operator. The pressure of the gauging members against the work is mechanically determined and therefore uniform.

Check the Ames Dial Comparators shown — one of them may solve a Quality Control problem for you.

Ames No. 1 Dial Comparator is an easily adjustable bench model that measures objects up to 2" in cross section. The table bracket may be quickly located and locked in position on the column. The table itself may be further positioned and locked for final fine adjustment. This comparator is designated *Ames No. 1W* when equipped with dead-weight contact pressure and contact area to ASTM specifications for measuring resilient materials, such as rubber, plastics, etc.

Ames No. 2 Dial Comparator is a compact, stable bench model for measuring non-yielding materials — sheet metal, glass, hard rubber. The 2" diameter table is adjustable to bring pointer to zero. *Ames No. 2W* is similar to the Ames No. 2, but is furnished with dead-weight contact pressure and contact areas to ASTM specifications for checking textiles, plastics, sheet rubber, etc.



Ames No. 13 Dial Comparator features flat-ground, cast-iron base of ample size for using V-blocks and locating fixtures for checking rounds, flats and odd shapes. Also, the No. 13 can be fitted with a fine adjustment for close setting. Accurately adjustable bracket holds any Ames Micrometer Dial Indicator.

Ames No. 130 Dial Comparator is designed especially for inspecting comparatively large parts. For this reason, the flat-ground steel base, the adjustable indicator support on which can be mounted any Ames Micrometer Dial Indicator, and the upright column are proportioned to suit the user's particular requirements.

Send us your Quality Control job specifications, and we will supply complete details and proposal without obligation.

Representatives in principal cities — B. C. AMES CO. — 76 Ames Street, Waltham 54, Mass.

Mfgr. of Micrometer Dial Gauges • Micrometer Dial Indicators

NAMES in the NEWS

•

Kenneth G Roe is new sales mgr for refrigerators with General Electric Co, and **Marshall Bartlett, Jr,** will replace him as production-planning head of the department. **Richard D Tyler** has been named mgr of marketing and **Thomas J Kelly** is now mgr of engineering for GE's appliance-control dept.

Col John R Howland has been appointed to fill a new position, that of commercial sales mgr, in Stewart-Warner Electric div of Stewart-Warner Corp. Col Howland has a background in electronic sales, and is a former member of the National Television Systems Committee that set up standards for TV operations.

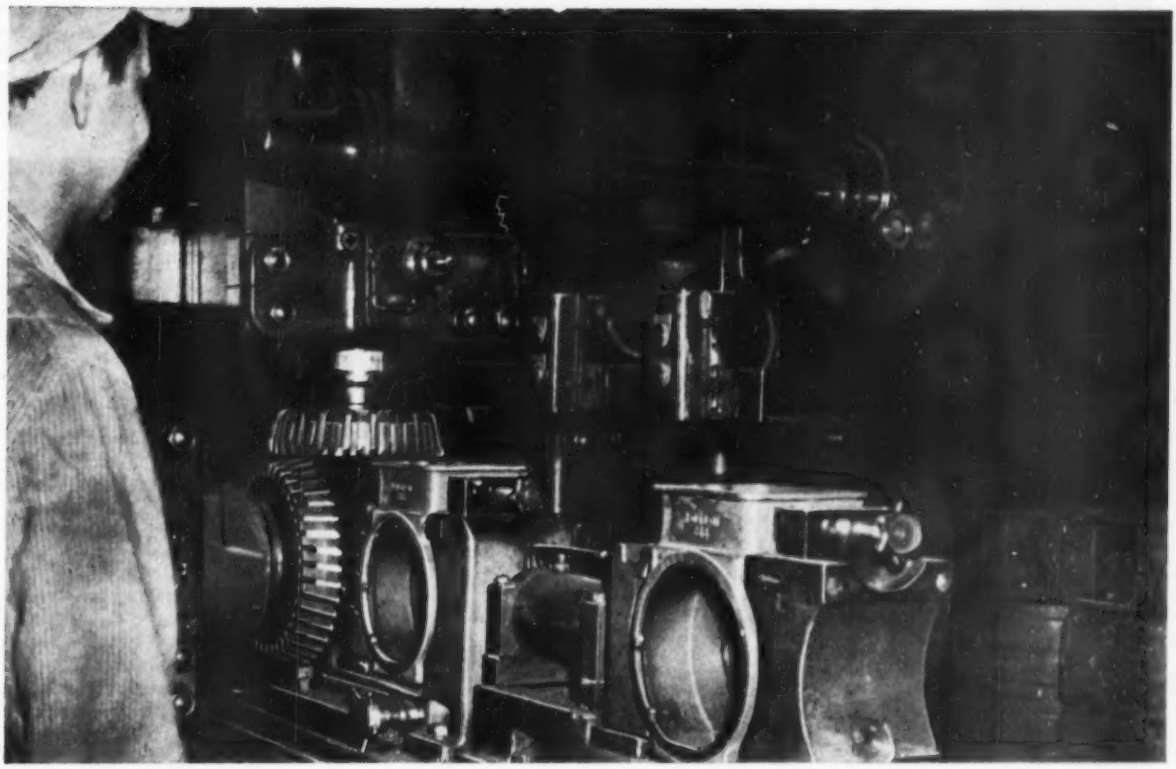
Thomas R Griffith has moved from New York to the northeastern Pennsylvania office of L S Starrett Co, replacing **Clyde Starrett,** who has moved to the home office. **Tudor Garland** has been assigned to the New York office, **Walter Clark** has been moved to north-central New York, **Harold E Sherwood, Jr,** has been assigned the south-central territory, and **Frederick Clarkson** has been appointed to assistant to the advertising mgr of the firm.

J A Leek, former New York mgr for Industrial Chemicals Div, American Cyanamid Co, has been moved to the position of eastern district mgr. **E J Adams,** formerly a sales representative of the same division of the firm, is named as southern-district mgr. **W H Leon,** formerly in the midwest, has been named western-district mgr for heavy chemicals.

James H Taylor is now chief electrical engineer with United Engineering & Foundry Co, succeeding **Robert H Ellis,** who has been made consulting electrical engineer for the firm. He has been connected with slabbing- and strip-mill setup for United in Wales, England.

William C McConnell, sales engineer in Detroit for Reliance Electric & Engineering Co, has been moved to Cleveland. **Robert B Reed** has shifted from Birmingham, Ala, to Detroit, and **Rex T Willard** replaces Mr Reed in Birmingham.

Robert Nigham and **Jack R Clemens** are new project engineers with T A B Engineers, Inc. Mr Bigham will work in production processing and tooling, and Mr Clemens in the mechanical div.



450 pieces per grind...
Despite Vibration

HAYNES STELLITE alloy milling cutter blades are being used successfully to machine gas-meter bodies, despite considerable vibration. The meter bodies have thin walls with respect to their other dimensions, and even though they are held in a rigid fixture, vibration cannot be completely eliminated. HAYNES STELLITE alloy tools have the toughness to withstand the chatter and also the red hardness to do the job fast.

Three milling heads, each containing 36 standard HAYNES STELLITE blades, face the flange at the top of the meter and straddle mill the two sides simultaneously. The tools previously used produced as few as 14 pieces per grind. HAYNES STELLITE tools produce an average of 450 pieces.

For information on how to use HAYNES STELLITE tools on your machining jobs, write for the new manual, "HAYNES STELLITE Metal-Cutting Tools."

HAYNES
TRADE-MARK
alloys

Haynes Stellite Company
A Division of
Union Carbide and Carbon Corporation
UCC
General Offices and Works, Kokomo, Indiana
Sales Offices
Chicago — Cleveland — Detroit — Houston
Los Angeles — New York — San Francisco — Tulsa

"Haynes" and "Haynes Stellite" are trade-marks of Union Carbide and Carbon Corporation.

All Lovejoy Blades for Type "A" Milling Cutters are interchangeable from 4½" to 24" in diameter
. . . and this applies to every "A" cutter ever made!
Lovejoy Type "A" face milling cutter blades offer unsurpassed economy — 1) they are interchangeable throughout the complete range of housing sizes, 2) H.S.S., carbide and cast alloy blades are interchangeable in every housing, 3) every blade will fit every Type "A", even if you have housings 30 years old, 4) only a minimum of stock must be removed when sharpening, 5) a large percentage of every blade is usable; 6) there is no need to carry a large inventory, as Lovejoy can supply blades promptly from stock. For superior performance, plus maximum economy, use Lovejoy Type "A" for every face milling job.
Write for free catalog!
LOVEJOY Tools
128 MAIN ST., SPRINGFIELD, VERMONT
LOVEJOY
TOOL COMPANY, INC.

J H Humberstone, vice president of Air Reduction Co, was elected second vp of American Welding Society at its meeting in Philadelphia. He is also chairman of the board of Airco.

Reed A Weyburn has been named as representative — distributor sales for Flexible Tubing Corp, where he will assist A H Loux, manager—distributor sales. Formerly Mr Weyburn was a sales engineer in charge of the Pacific Northwest for the company's steel-strapping div.

Arthur H Beasley has been appointed manager, Memphis sales branch, of Wagner Electric Corp, where he succeeds **A Callaway Allen,** now sales mgr of the company's electrical div. Mr Beasley is transferring from the company's Chicago office.

Sigmund Toth has been appointed shop superintendent for Beatty Machine & Mfg Co, advancing from machinist and foreman. **John Borkert** has been named chief engineer of the same firm, moving from design of heavy machinery in his own engineering business.

James P Roberts, Los Angeles sales mgr for Ford Div, Ford Motor Co, has been moved to Chicago to cover the midwest territory.

William E McCullough has been appointed sales engineer for Capwell Mfg Co in western Pennsylvania, eastern Ohio, and northern W Virginia, succeeding **C D Libby.** Mr McCullough formerly handled sales in the same territory for A O Smith Corp.

William L Gillespie is now field salesman for Chicago and the Midwest for Hooker Electrochemical Co, having been transferred from development and research.

J Y McCandless will be in charge of a new office in Syracuse, NY, for Babcock & Wilcox Co, tubular-products div. He has transferred from the Beaver Falls office of the company.

John I Somers will handle sales of Worksaver electrical hand lift trucks, and **T F Moriarty** will handle sales of manually operated lift trucks for Yale & Towne Mfg Co under a new arrangement where the sales departments will operate separately.

W Harrison Lackey has shifted from plate-sales specialist to mgr, plate sales, Lukens Steel Co. His background is in sales and as a gun-mount supervisor.

L J Call, Jr, has been named chief draftsman of Hooker Electrochemical Co, moving up from the position of asst and designing engineer.

Richard K Hungerford has been transferred from New York to act as district mgr in Baltimore for Wheelco Instruments Div, Barber-Colman Co. **Howard P Berger** has been transferred from Baltimore to Cleveland, **Gordon Hubbert** has been moved from Chicago to Detroit, and **Harold F Dahlke** has shifted from Chicago to New York. Three new offices for the company are: Grand Rapids, under **Robert P Campbell;** Cincinnati, under **Edmund C McFaul;** and Clarksburg, under **Earl J Kelly.** A sub-office in Charleston, W Va, will be in charge of **J McKeown.**

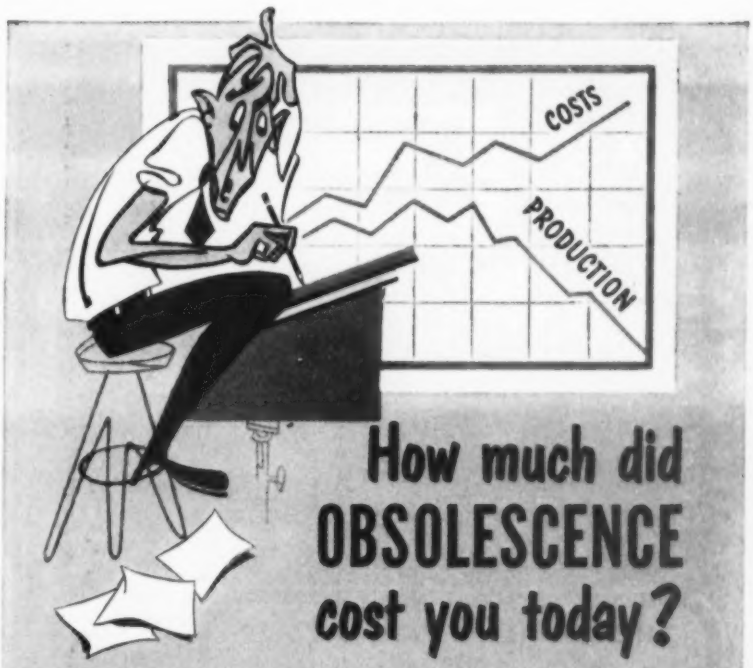
David S Hodgson has been appointed sales mgr in New York for The Producto Machine Co, in which capacity he will oversee the new sales office and warehouse at Rochester.

B N Clarke has been appointed New England sales mgr for Surface Combustion Corp, and will handle special heat-treat equipment out of Quincy, Mass. Mr Clarke has been in technical development and service with the company.

J W Woodward has resigned as research engineer with North American Aviation to become West Coast representative for R M Hollingshead Corp. He replaces **J M Reed,** who has been reassigned to the Camden, N J, headquarters of the firm. Three other Hollingshead appointments are: **A E Moore** to the position of vp and director of research and development; **V M Mantz** to director of government and industrial research; and **Dr V Esposito** to director of new-products development.

Carl P Brown has been named mgr of industrial and export sales for Kobe, Inc, div of Dresser Equipment Co, transferring from Houston, Tex, to Cleveland.

A S Blodget, Jr, has been named Pittsburgh district mgr for Air Reduction Sales Co upon the death of **S D Edsall.** Mr Blodget will be replaced in his former location in Boston by **E S Twining, Jr,** former Philadelphia asst sales mgr.



How much did OBSOLESCENCE cost you today?

The fastest way for a machine to become obsolete is for someone to develop a new machine to do the same job faster, better, and more economically.

Look at it this way. Say you operate a machine tool that turns out 50 work units an hour. If your competitor installed a 100-unit-per-hour machine at a price comparable to yours, his competitive unit cost would give you trouble. In effect, the minute he went into production, your machine became obsolete.

When it comes to constant efforts to improve our product, CLARK pleads guilty. The quality fork truck that you bought some years ago may be secretly (to you) suffering from obsolescence, even though it is still doing the job you bought it for. It's not hard to recognize obsolescence when it shows up in high maintenance costs and repair bills. But that's only going skin-deep. The important thing to know is this: how much faster, how much better and at how great a savings can you do the same job with today's CLARK trucks.

New CLARK Trucks to replace your obsolete equipment will step up production and cut service charges so drastically that they'll soon pay for themselves.

How much did obsolescent handling equipment cost you today? You owe it to yourself to know—and then to capitalize on that knowledge by calling in your nearby CLARK Dealer. He'll help you set up a *profitable* modernization program.

1903 1953
FIRST FIFTY YEARS
CLARK EQUIPMENT

CLARK ELECTRIC AND GAS POWERED FORK TRUCKS
AND POWERED HAND TRUCKS • INDUSTRIAL TOWING TRACTORS

INDUSTRIAL TRUCK DIVISION • CLARK EQUIPMENT COMPANY • BATTLE CREEK 3, MICHIGAN
Please send: ☐ Material Handling News ☐ Movie Digest ☐ Have Representative Call.
Name
Firm Name
Street
City Zone State
AUTHORIZED CLARK INDUSTRIAL TRUCK PARTS AND SERVICE STATIONS IN STRATEGIC LOCATIONS

Boye & Emmes standard headstock, with cover removed, showing constant mesh, wide face gears and large diameter, positive jaw, sliding clutches.

THE LATHE CAME BACK*

-After 25 Years-

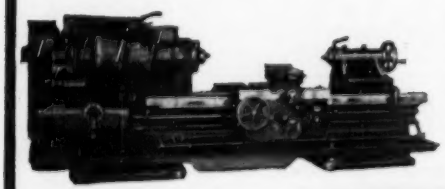
•

HEADSTOCK GEARING
"GOOD AS NEW"

Boye & Emmes Engine Lathe No. 300-141, owned by The Timken Roller Bearing Company, Canton, Ohio, was returned for factory inspection after twenty-five years of day-in-day-out use. During this period, Timken purchased repair parts from us, for this machine, to the extent of $154.15. Yet, when the headstock cover was removed at the factory the gearing was found to be "as good as new." This is usual.

CONSTANT MESH GEARS
POSITIVE JAW SLIDING CLUTCHES
SPELL OUT THE ANSWER

The principle of power transmission which is used in Boye & Emmes Engine Lathes incorporates constant mesh headstock gearing, with speed changes effected through positive jaw, sliding clutches. This construction eliminates gear wear due to shifting action, allows shorter shafts, less space between bearings, and hence more accurate and rigid construction.



FREE LITERATURE

If you are not now using Boye & Emmes Long Life Engine Lathes, investigate. Compare this lathe of low maintenance and high accuracy from every viewpoint. Specifications and details of construction for all sizes are contained in our free Bulletin No. 601. Write for it today!

*One of many documented cases of "no wear" in Boye & Emmes constant mesh lathe headstock, after years of use.

LONG LIFE LATHES

BOYE & EMMES
MACHINE TOOL COMPANY
125 CALDWELL DRIVE
CINCINNATI 16, OHIO

Jack Nathan, former New York representative for Snap Products Corp, has assumed the duties of eastern district mgr for Quijada Tool Div, Gaines-Collins Co. **J Jay Smith** has been appointed central states mgr for the company, moving from sales and engineering work for American Machine & Metals, Inc, Kropp Forge Co, and American Gear & Mfg Co.

Kenneth A Moore has retired as general traffic mgr for Automobile Manufacturers Assn after 32 years of service. He held previous positions as traffic mgr with Armor Plate Div, Standard Spring Steel Co and Reo Motor Car Co.

Frank W Hogan has been appointed asst to the sales mgr of Adamas Carbide Corp, where he will be responsible for sales promotion and advertising.

John Muchmore has joined AiResearch Mfg Co as staff asst to the director of public and industrial relations, moving from Hughes Aircraft Co, earlier from Douglas Aircraft Co.

Dr Harold K Work, director of research div, New York University College of Engineering, has been appointed a trustee of American Society for Metals' education and research foundation. The foundation is a recognition of the shortage of engineers and the importance of metals research.

Robert F Tighe has assumed duties as Cleveland mgr of Kaiser Aluminum & Chemical Sales, succeeding **Robert H Black,** who has moved to Kaiser's general offices at Oakland, Calif. Mr. Tighe was product mgr for pig and ingot in Chicago.

John W Brophy is the new wks mgr of Cleveland Diesel Engine Div of GMC, where he has moved from his position as acting gen mgr of GM Diesel at London, Ontario. He is former director of purchasing and production control for the company.

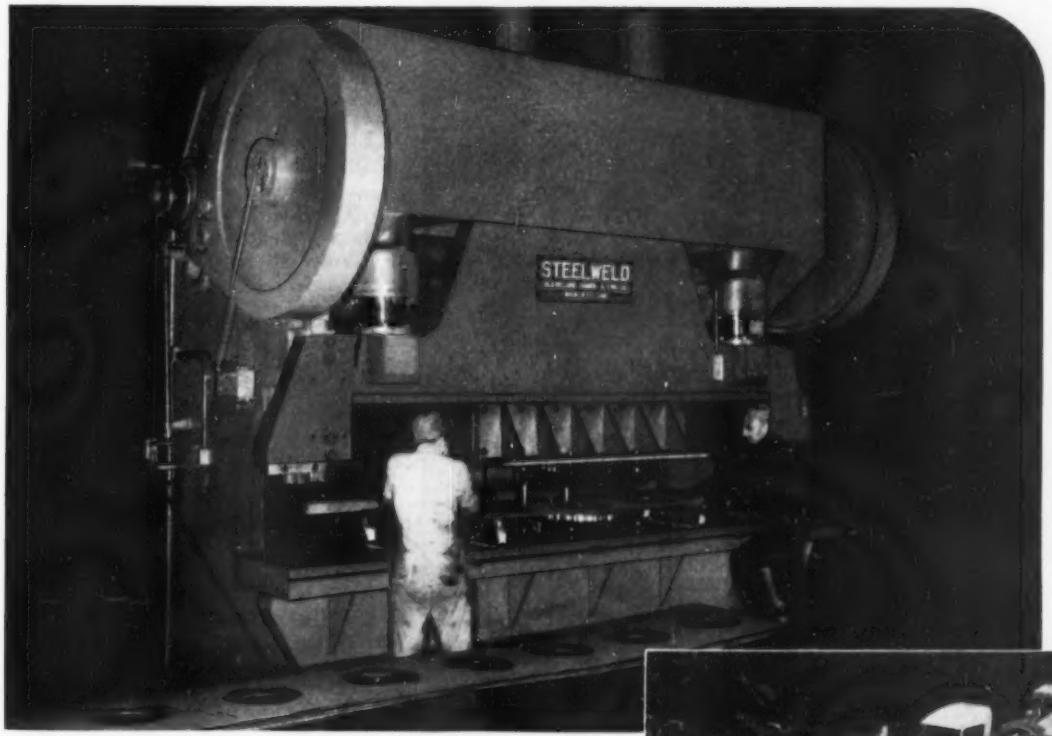
Harold C Conners has been announced as asst to the president of Graver Tank & Mfg Co. His background is in sales engineering.

Rollin D Hager has been appointed gen mgr of industrial-products manufacturing for B F Goodrich Co, and will be responsible for company operations on industrial products in Akron, Clarksville, Tenn, Cadillac, Mich, Marion, O, and DuBois, Pa.

Punches 15" Holes For Warner & Swasey Gradalls

Also Performs Bending and Flanging Operations

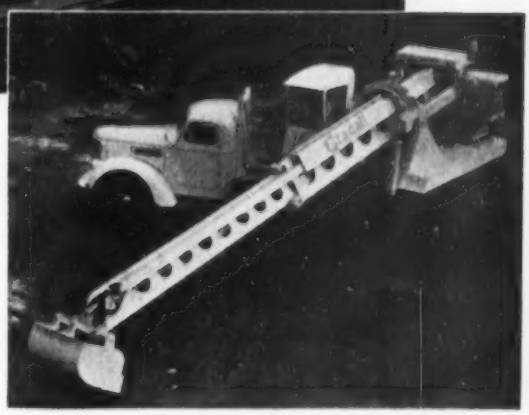
Flanging 15" diameter holes in outer boom plates of 3/16" steel. The holes were punched previously on this press.



Practically all of the steel plate on Warner & Swasey Gradalls, manufactured at their New Philadelphia, Ohio plant, is formed, punched and flanged on a Steelweld Press which is designed to brake steel plate up to 16' x ½".

One of the more interesting jobs done on this machine is the punching of 15" diameter holes in Gradall boom plates, followed by a flanging operation. Through use of special movable punches, many smaller holes of various sizes are made at a time, in locations as desired.

The versatility of Steelweld Presses to handle efficiently many varied operations has proven of tremendous advantage to many users. You, too, may find the many features of these machines of great help. A representative will be glad to give you the details.



Gradall ready for action. Has ½ yd. bucket and 24 ft. telescoping boom that lifts, tilts, and turns 360° around truck.

GET THIS BOOK!

CATALOG No. 2010 gives construction and engineering details. Profusely illustrated.

THE CLEVELAND CRANE & ENGINEERING CO.

1442 EAST 281st STREET, WICKLIFFE, OHIO

STEELWELD

BENDING PRESSES

BRAKING • FORMING • BLANKING • DRAWING • CORRUGATING • PUNCHING

BIG JOBS...
SMALL JOBS...
HOLD
with
Magna-Lock
electro-magnetic
CHUCKS
Get maximum flexibility . . . use Magna-Lock Chucks singly or in multiples, according to size of job. Work in dimensions up to machine tool's capacity. 22% more holding area, moisture proof, other exclusive advantages. 3 types, many sizes.
Get details . . . WRITE DEPT. AM-13
Magna-Vise*
. . . INCREASES THE VALUE OF YOUR MAGNETIC CHUCKS . . . ENABLES THEM TO HOLD NON-MAGNETIC MATERIALS . . . Send for facts.
*Patented
Magna-Lock is first to increase your machine's productivity
Hanchett MAGNA-LOCK CORPORATION
Magnetic Chucks and Devices
BIG RAPIDS, MICHIGAN, U. S. A.

Dr Bernard Vonnegut, well known for his pioneer work in artificial rainmaking, has joined Arthur D Little Co, consulting engineer, to engage in research on nucleation phenomena.

H M Kirby has been appointed sales-promotion mgr of the steam-generator div of Clayton Mfg Co. The appointment is in line with current expansion of the steam-generator line.

Joseph A Davis has been named district sales manager, Chicago, for Riverside Metal Co. **Joseph F Linus,** sales service mgr, has been moved up to take Mr Davis' former position of home-office sales mgr, and **Gordon W Jones** has been upped to sales service mgr.

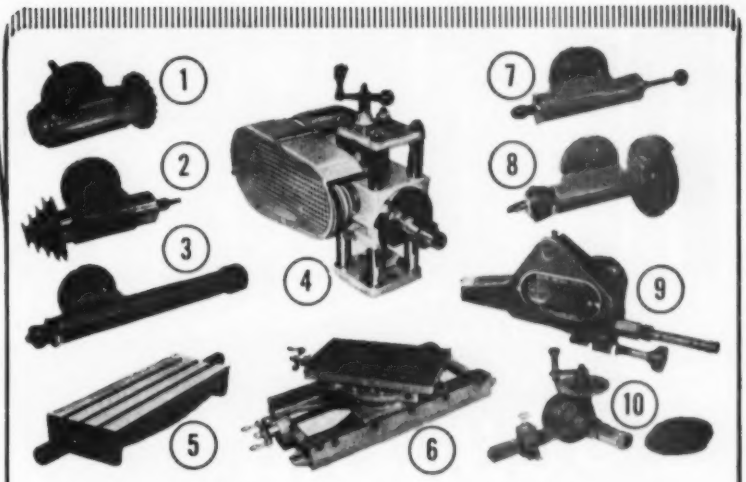
J E Mullen has been appointed regional sales representative in Ohio and Pa, for Brad Foote Gear Works, Inc, moving to this job from his former position as vice president in charge of sales at National Erie Corp.

John M Tuthill, manager of flat-rolled sales for Youngstown Sheet & Tube Co, has been appointed asst general manager of sales in Chicago, succeeding **Arthur M Long,** who recently died. **L E Arnold** succeeds Mr Tuthill, transferring from the Detroit sales office. **Jay W Owings,** asst general manager of sales for the company, has resigned to enter business in Magnolia, Ark. **Paul R Rauch** has been appointed asst chief inspector for the Youngstown district for the company, shifting from general foreman of the Campbell Wks.

"I don't care if you do work 90 hours a week—no television"

master
MACHINE TOOL ATTACHMENTS

for
LATHES
TURRETS
MILLS
OR USE INDEPENDENTLY



1. 90° Universal Milling Head
2. Hi-Speed Milling and Drilling Head
3. Deep-Hole Internal Grinder Head
4. Basic Milling Unit
5. Milling and Grinding Table
6. Universal Feed Table
7. Internal Grinder Head
8. External Grinder Head
9. Slotting and Keyseating Head
10. Geared Dividing Head

Master MACHINE TOOLS

★ ★

THREE SIZES

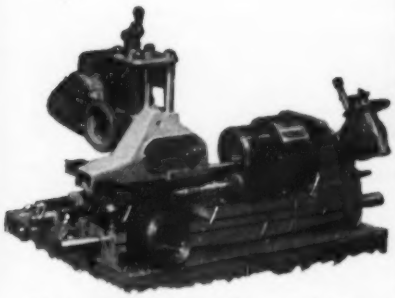
MODEL "C," ⅓ hp — 9" TO 13" LATHES
MODEL "B," ½ OR ¾ hp — 13" TO 18" LATHES
MODEL "M," 1 OR 1½ hp — 18" TO 72" LATHES

★ ★

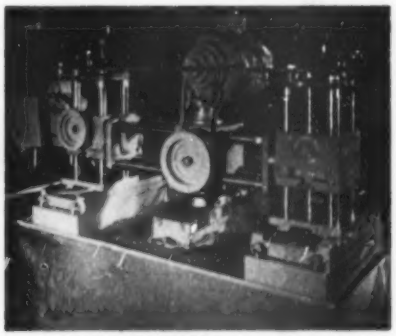
The Master attachment can be used profitably on many production operations. Mount it on your present equipment, lathes, turrets, mills, or use independently to perform additional operations in the same set-up. The basic milling unit with the above types of precision heads gives you facilities for milling, grinding, boring, drilling, indexing, slotting, and keyseating, both internal and external. Therefore, the Master with its full complement of equipment is an outstanding value for general purpose use in maintenance, repair, tool room, and experimental shops, as well as production, thus providing equipment that performs a full range of shop operations at a minimum investment. These improved models of Master attachments are outstanding in rigidity, capacity, and simplicity of set-up and operation and incorporate the latest features developed in our seventeen years of manufacturing this tool. Investigate this valuable shop tool. For the cost of one single-purpose machine, you can have several Master units producing. Prompt deliveries.

Makes Low-Cost Independent Production Set-Ups — Portable — Self-Powered

End Milling 2½" keyway in 9⅞" diameter shaft 22 ft. long



Master portable key seating and slotting head cutting internal splines on bench set-up



Special portable milling machine made from standard Master components, variable post lengths. Power feed universal head

FREE

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MASTER MANUFACTURING CO.
1322 EAST AVENUE A • HUTCHINSON, KANSAS, U.S.A.

RE-ORDERS

From Prominent Users of More Than 10 Years Prove the DEPENDABILITY of

JOHNSON METAL CUT-OFF BAND SAWS

They Buy

AGAIN and AGAIN!

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Model J, pictured, 10"x18" Capacity, available as a wet or dry cutting machine. Also Junior Model B (with or without casters), 5"x10" Capacity.

JOHNSON MANUFACTURING CORP.
ALBION, MICHIGAN

Robert T Jennings has been appointed sales application engineer in the Detroit district for Reliance Electric & Engineering Co, advancing from sales and engineering work in the company. **William F Kiser, Jr,** has been appointed to the same job in the Philadelphia district sales office. **John M Duff** has been assigned to the applied engineering and industrial sales department of Reliance, advancing from the design staff of the company.

J J Matich, formerly sales engineer with F H Langsenkamp Co, has joined Parker Appliance Co as industrial sales engineer, headquarters in Indianapolis. His background is with agencies in the machine-tool industry.

Lawrence W Mattson will be West Coast district manager of American Machine & Foundry Co's Pinspotters Div after transferring from American-Coleman Co. Mr Mattson was formerly vice-president and general manager of General Aircraft Corp, and was on the staff of the War Production Board in Washington during World War II.

Dr Wilson S Brubaker has been appointed senior research physicist and **Dr Paul Brock** has been appointed engineering mathematician on the Engineering and Research Staff of Consolidated Engineering Corp. Dr Brubaker was formerly a research engineer on the wartime Manhattan project and worked in the physics department of Westinghouse Electric Corp. Dr Brock has done computation work with the Kellex Corp and Reeves Instrument Corp.

York Corp has elevated a number of research and development engineers to engineering managers to develop new products: **S B Nissley** will handle reciprocating compressors; **R D Blum,** central-station air conditioning; **R A Chadburn,** heat-exchange equipment; **J H Anderson,** turbo compressors; **S P Soling,** engineered applications; **P B Moore,** single room air conditioners; **A E Diehl,** self-contained air conditioners; **H A Brysselbout,** ice makers; **P G Thayer,** hermetic compressors. **B E James** has been named assistant chief engineer in charge of package products and small systems. **J R Chamberlain** is now assistant chief engineer in charge of industrial products sold through direct-sales outlets. **F J Allen** has been appointed manager of engineering and chemical laboratories.

William O Springer has been appointed manager of Joseph T Ryerson & Son's New York plant, transferring from the company's Cleveland plant. He was formerly the head of the alloy and stainless steel dept, and later plant manager at Cleveland.

Norry W Hastings has been appointed chief chemist for Rezolin, Inc, manufacturers of Tool-Plastic die material. Mr. Hastings has had experience with a number of companies in the plastics field.

General Joseph T McNarney, USAF, retired, will assume the duties of **E P Fontaine,** former executive vice-president of Consolidated Vultee Aircraft Corp, who has resigned to accept an executive position in the aircraft industry in the east. Mr Fontaine has held the position of chief engineer for Convair's Stinson Div and of Convair's Vultee field division.

R B Stotz has been appointed manager of Airtemp Construction Corp subsidiary of Chrysler Corp. He is a former director of the division's activities in New York, Boston, and Philadelphia, and replaces **I C Baker** who recently died.

Harry R Sanow has been appointed general superintendent of Acme Steel Co's Riverdale Wks, advancing from the position of director of Acme's manufacturing divisions. Mr. Sanow has been in the production division since 1927.

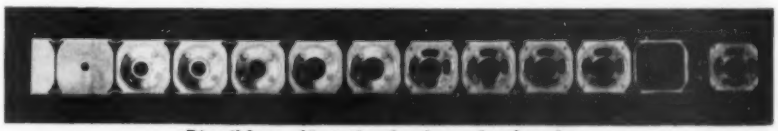
John E Lancaster has been appointed assistant chief engineer of Air Conditioning and Refrigeration Engineering Div, Worthington Corp, moving up from the research and development department where he was a test engineer, group leader, assistant manager, and acting manager of the department. **William C Osborne** has been named manager of research and development for the same company. His background is in electronics and centrifugal engineering. **Norman L Meyerson** has been appointed assistant manager of research and development department where he has worked since 1942. **Frederick C Gilman** has been appointed research engineer, advancing from test engineer and junior engineer in the experimental departments. **T A Herman** has been appointed assistant chief engineer of the reciprocating engineering division, advancing from design engineer.

B. Jahn PROGRESSIVE DIES SAVE* AMERICAN INDUSTRIES *Millions!*

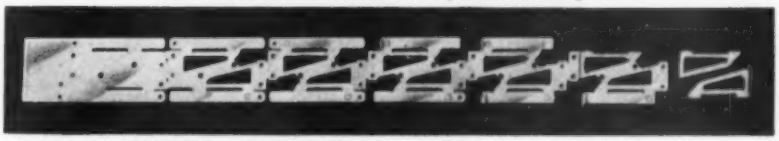
Thousands of unnecessary, costly operations have been eliminated from America's production lines by B. Jahn! Actual die strip photographs illustrate intricate — seemingly impossible tooling problems overcome by B. Jahn's versatility and ingenuity.

Production runs increase — set-up time is slashed — individual press operations are eliminated — better die products result — for every B. Jahn built die is PRODUCTION PROVED *to the customer's complete satisfaction.*

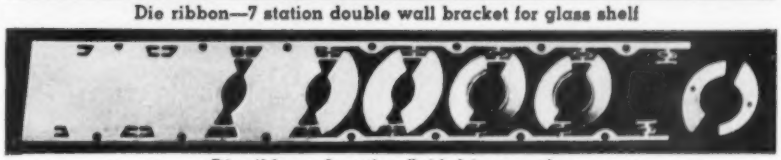
*B. Jahn Progressive dies not only SAVE millions, they MAKE millions!



Die ribbon—11 station loud speaker housing



Die ribbon—7 station double wall bracket for glass shelf



Die ribbon—6 station fluid drive coupler

By running from 10 to 50,000 parts or complete assemblies for customer's production line use *before the die is delivered,* error is eliminated! guesswork ended! chance abolished! The die is certified PRODUCTION PROVED!

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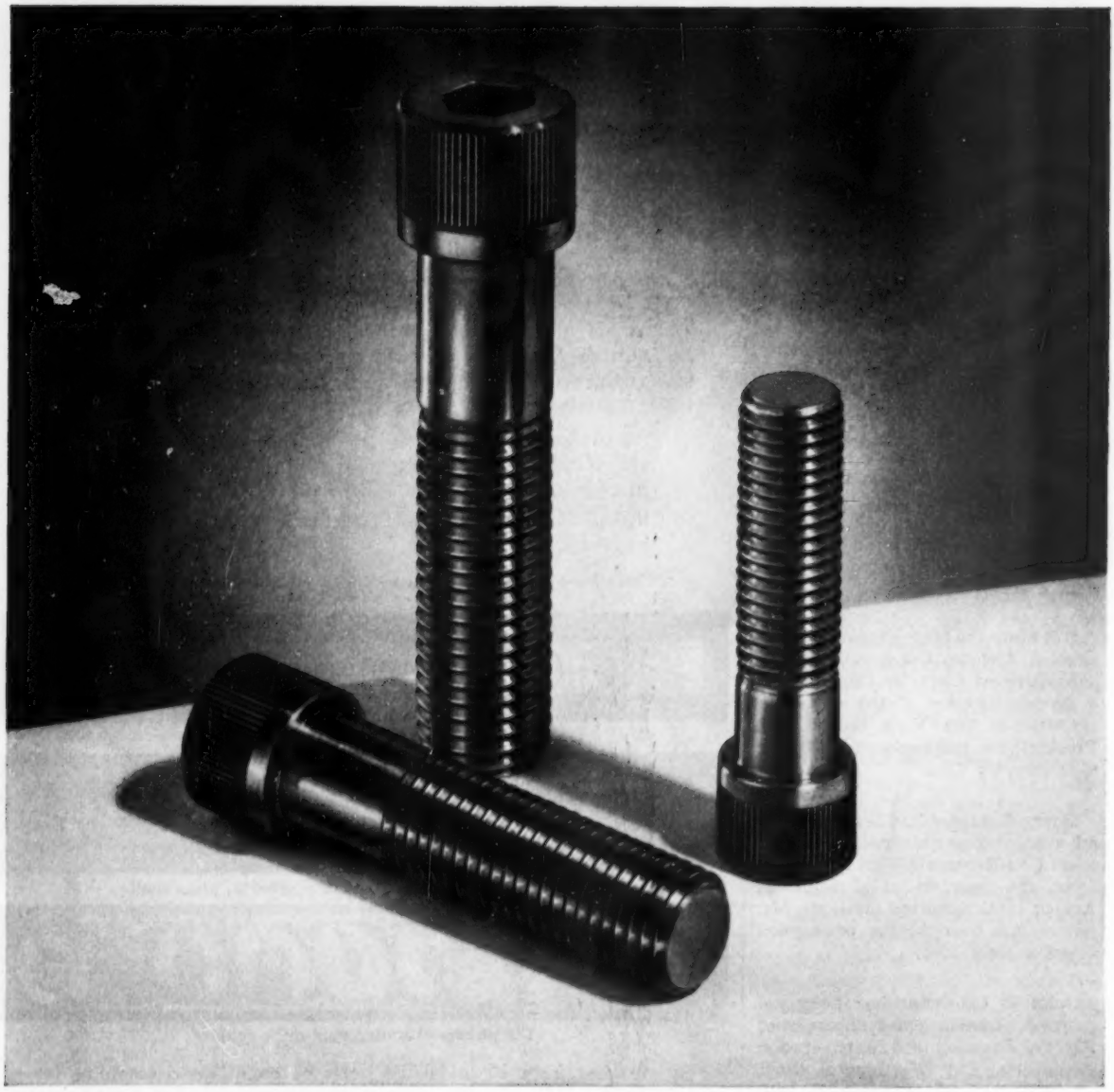
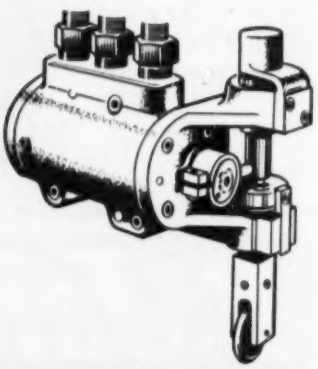
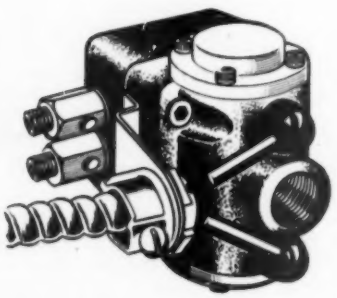


UNBRAKO SOCKET CAP SCREWS have knurled heads for sure grip and fast assembly; accurate hex sockets for positive, nonslip internal wrenching; fully formed threads, Class 3 fit. They are made of heat treated alloy steel, with controlled fillet and continuous grain flow, for strength; and are available in standard sizes from #4 to 1" in a full range of lengths.



USE UNBRAKO SOCKET CAP SCREWS for compact designs to save space, weight and material on machine tools and metalworking equipment.



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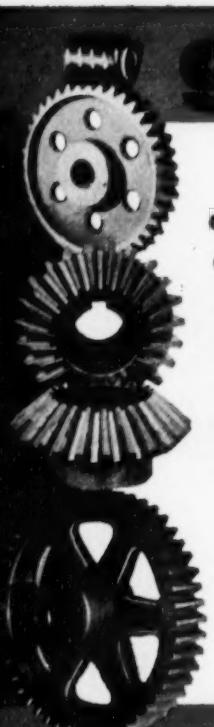

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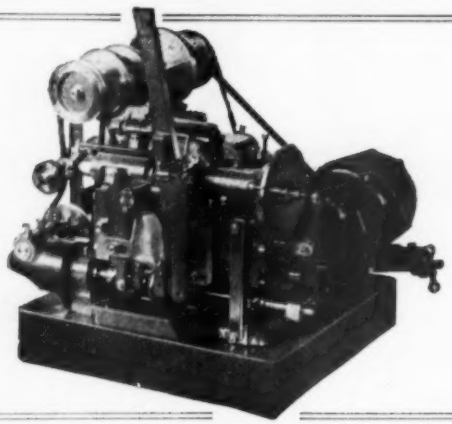

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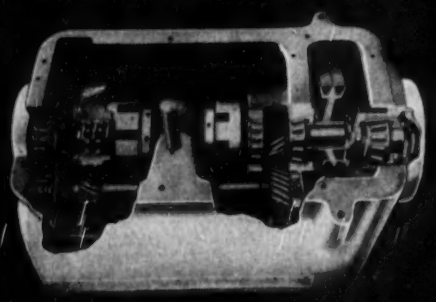

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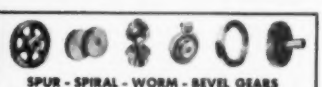

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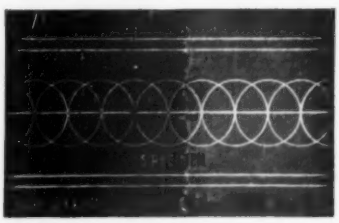

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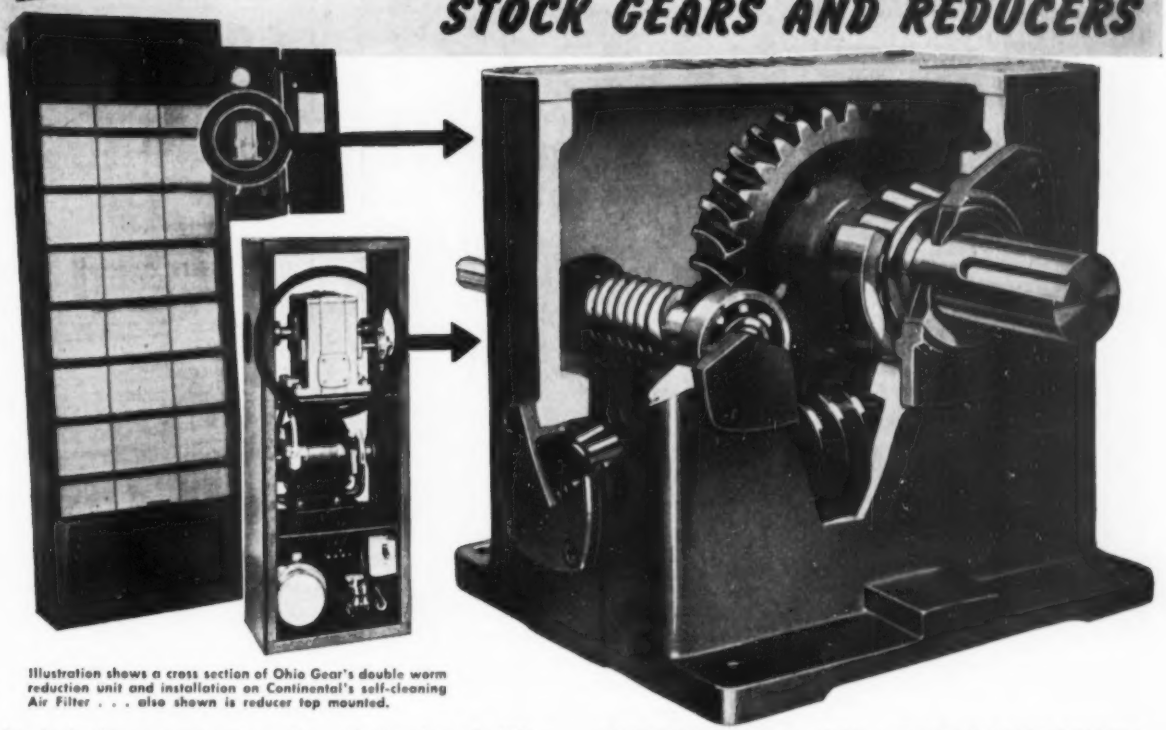

Illustration shows a cross section of Ohio Gear's double worm reduction unit and installation on Continental's self-cleaning Air Filter . . . also shown is reducer top mounted.

In designing a new automatic self-cleaning air filter, Continental Air Filters, Inc. of Louisville, Ky., gave careful consideration to the known short-comings of existing automatic filters. Continental made exhaustive studies of all accessories to the filter, and for reasons of sound engineering design, dependable and accurate performance, reputation and physical impactness, an Ohio Gear reducer was chosen. Just as industry depends on Continental Air Filter for the important function of keeping the air clean, so does Continental depend on Ohio Gear for accurate and consistent performance of their unit. This was an important factor in the largest installation of automatic self-cleaning filters under roof, the Ford Motor Company's Foundry, at Cleveland, Ohio. Continental considers the dependable operation of Ohio Gear reducers partially responsible for its success. Perhaps Ohio Gear can serve you as well. Get in touch with their nearest distributor or write direct to THE OHIO GEAR COMPANY, 1326 East 179 Street, Cleveland 10, Ohio.

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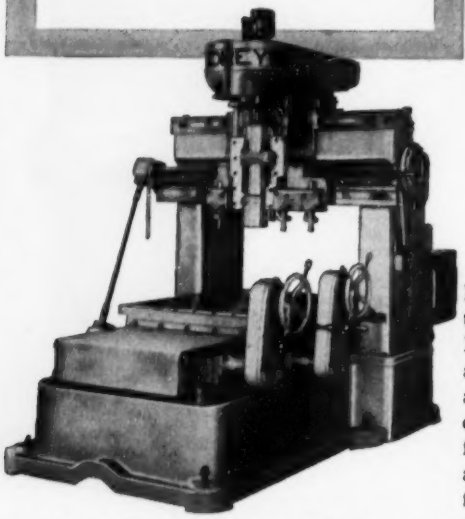
Vertical "Aeroframe" Profiler and Milling Machine



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Standard Machines hand feed. Power feeds any or all the movements.

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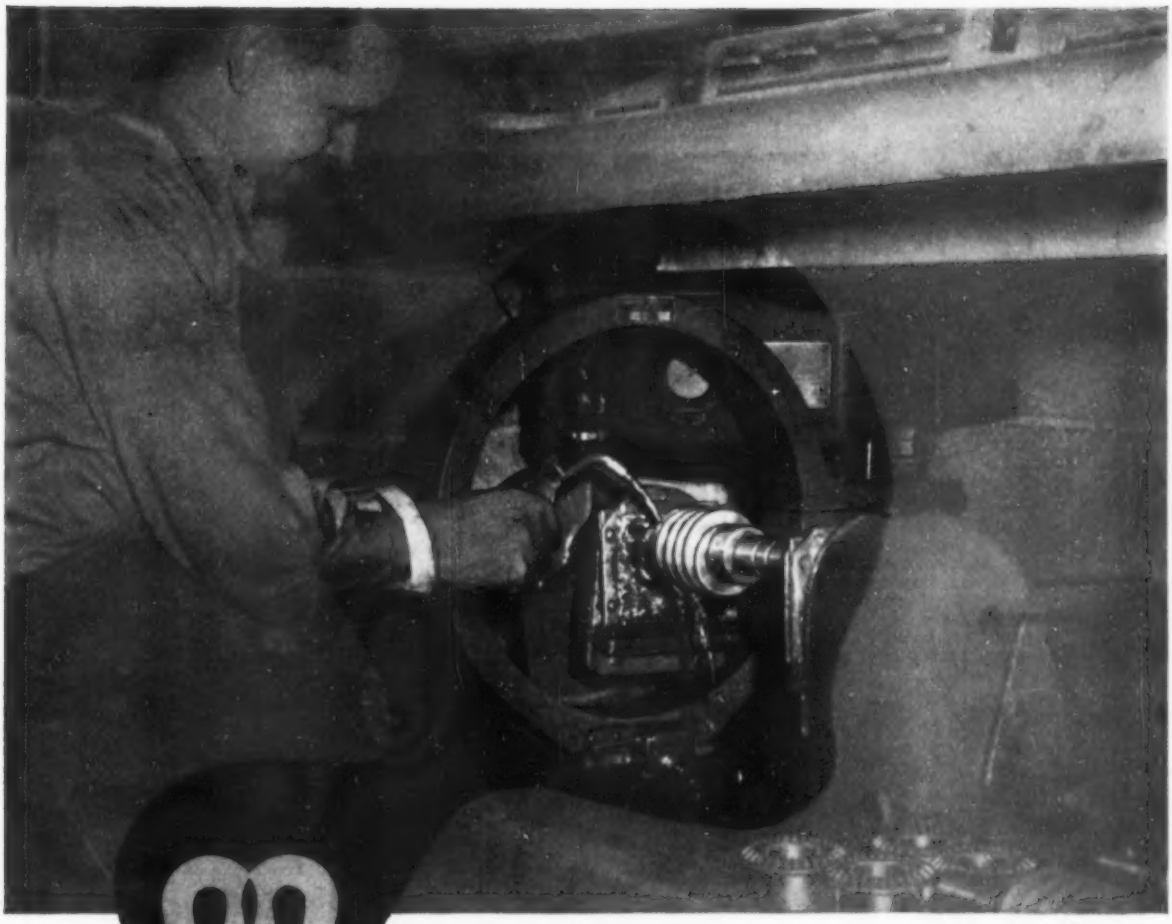

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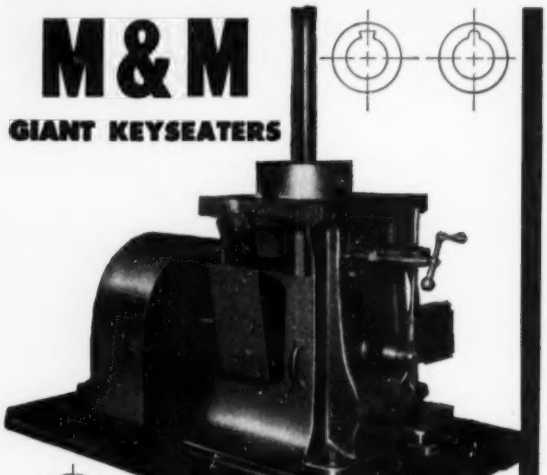

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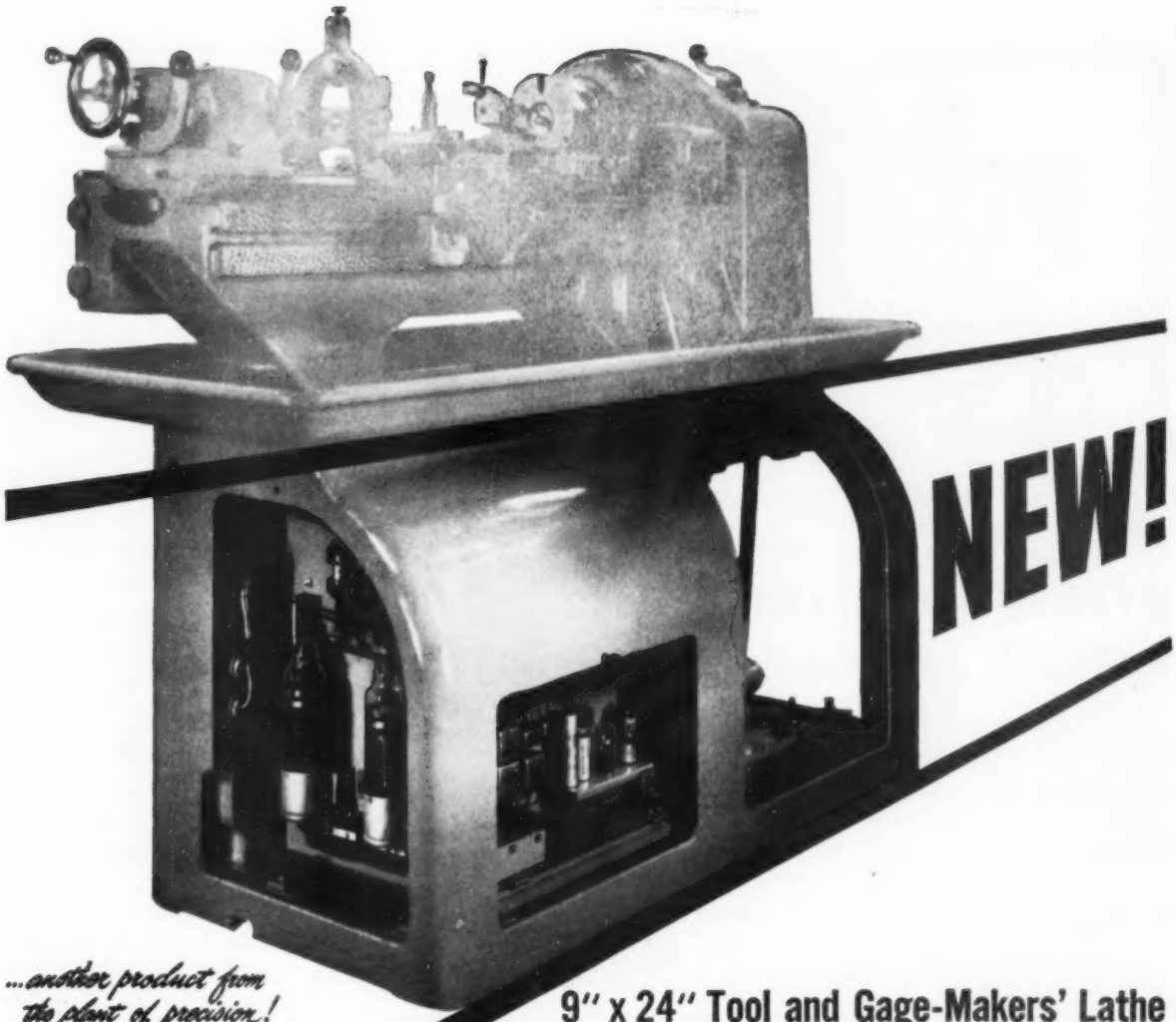

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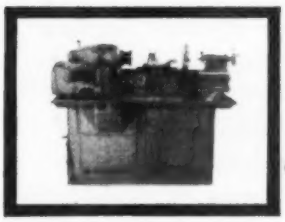

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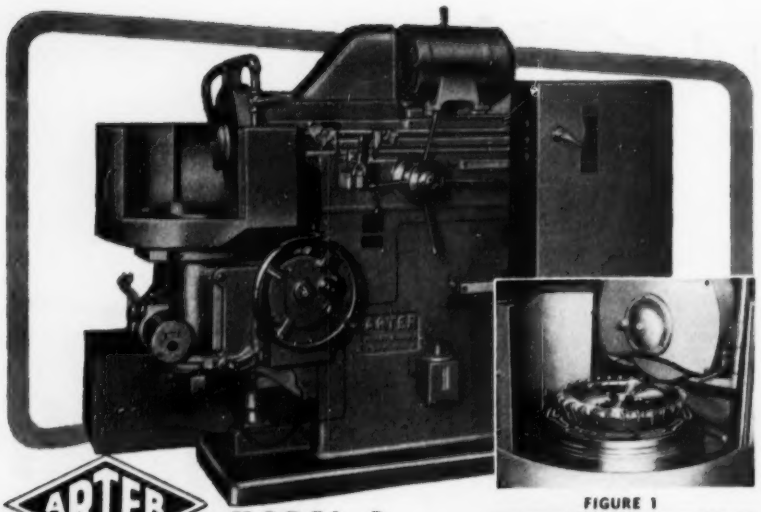

FIGURE 1

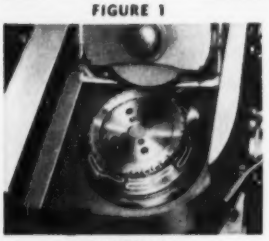

FIGURE 2

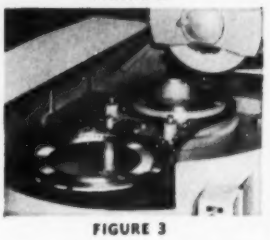

FIGURE 3

ARTER MODEL D

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FIGURE 1—Inserted carbide tooth milling cutters ground on standard machine.

FIGURE 2—Machine built especially for grinding 45° angles on cutters.

FIGURE 3—Special Model D grinds by plunge cutting; work fed automatically up to non-oscillating grinding wheel.

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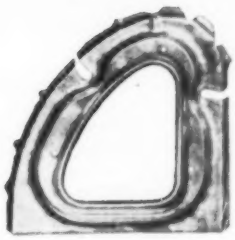
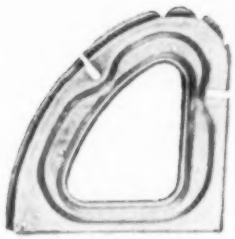


Formed in a conventional rubber pad press.



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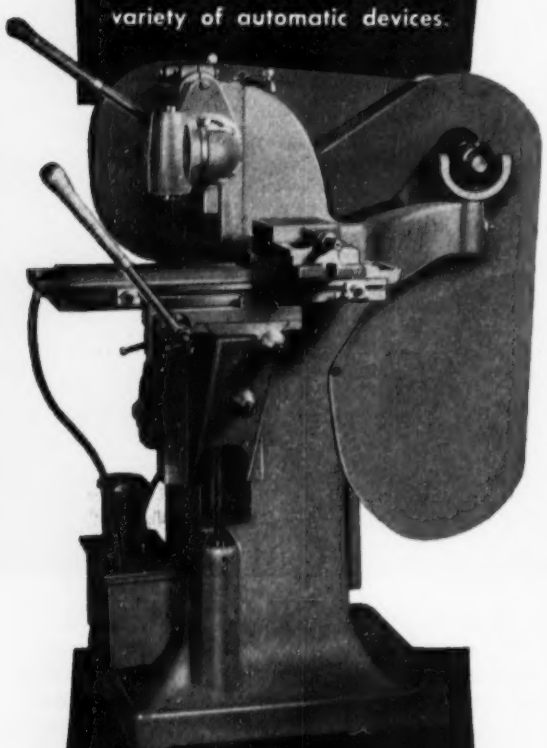

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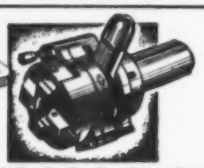

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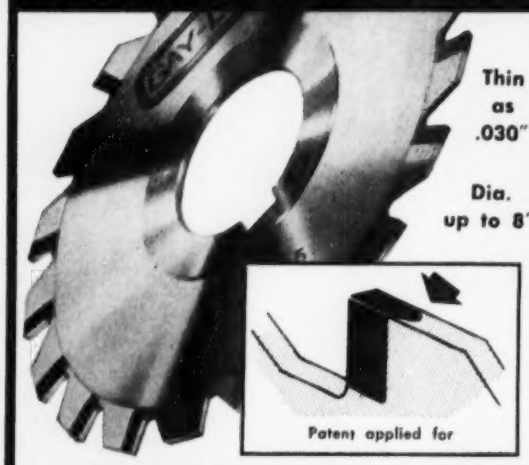

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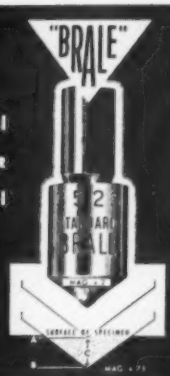

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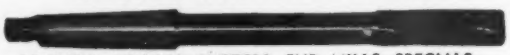

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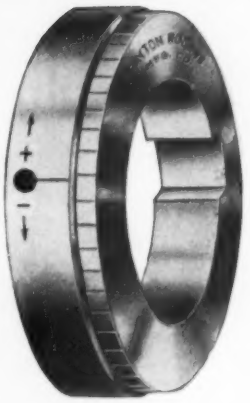

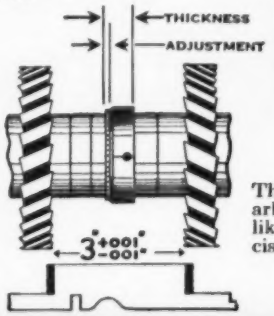

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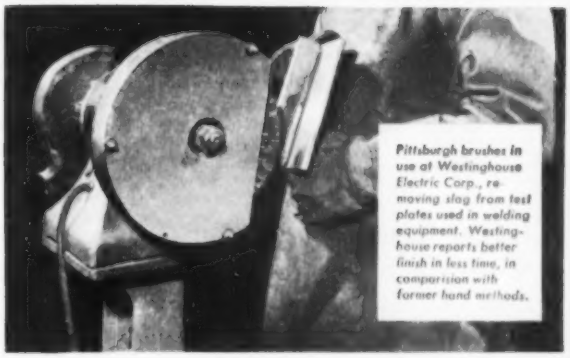

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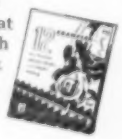

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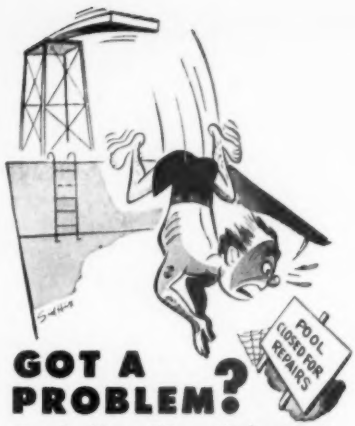

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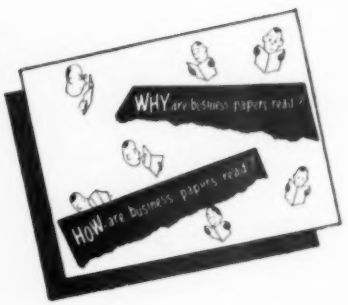

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12 ton V2 American vertical hyd.
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53" No. 24 Gardner horizontal disc
No. 72 Heald Gagematic & Sizematic
12" & 16" No. 22 Heald rotary surface
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16"x48" Landis crankpin grinder
No. 42 Van Norman radius grinder
Nos. 5, 16A, 16-28 & 24-36 Bryant

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No. 3B Kearney & Trecker, SPD
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36" x 36" x 8' Cleveland OS, one rail, one side head
36" x 36" x 10' Niles, AC motor drive
26" Smith & Mills back geared shaper, motorized
26" Worcester heavy duty shaper
26" Morton draw cut shaper
32" Ohio "Dreadnaught" motor drive shaper
36" Niles traveling head shaper
10" Betts slotter
12" and 16" Bement slotter
24" Niles Bement Pond Slotter

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¾" McCabe pneumatic flanger
Nos. 5N & 6B Hazel pneumatic forging hammers
16A16 Bryant Grinder
No. 78 Wilmarth & Mormon surface grinder
30" x 16' LeBlond Engine lathe
No. 5 Acme universal turret lathe, late
No. 5 Gisholt universal turret lathe, late
80 ton No. 50-D-36 Cleveland SS Dbl. Crank press, late
600 ton No. 23164 Hamilton eccentric sheft coining and forging press
600 T. No. 570 Toledo hi-speed forging press
10'x10 gauge George Ohl Sq. Shear
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Betts 8'—2 swivel heads—Height under rail 69"—MD
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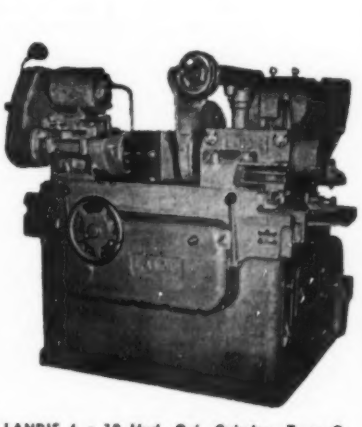
BALANCER, Anderson Bros. 14"x64", Rote-Checker.
BORING MILL, 24" Bullard M.D., V.T.L.
BORING MILL, 36" Bullard M.D., V.T.L.
BORING MILL, 36"x44" Niles Vert, M.D., Side Head
BORING MILL, 10' Cinci.-Vert., M.D. 2 heads.
BORING MILL, 2¼" Lucas Horiz., M.D.
BORING MILL, Lucas Horiz. 3" Bor, M.D.
BORING MILL, Giddings & L #8 Horiz. 3½" Bar.
BARRELS, Tumbling Lupomatic, Schutte & Koerting.
BROACH, #3 LaPointe Horiz. 50" Str. M.D.

COMPRESSOR, Ingersoll Rand ER-1, 10 HP, M.D.
COMP., 15 HP, 10 HP, Gardner Denver, M.D., New.
COMPRESSOR, C-P 50 HP., M.D., 10x10, 278 CFM.
COM., Ing.-Rand ER-1, 100 HP Syn. M.D.
CRANE, DET Ricker 2 tons 11'9" span.
CRANE, Canton #8 Portable Gooseneck 3 ton cap.
CHIP WRINGER, Barrett #251, M.D., 18" dia.
CHIP WRINGER, 20" Tolhurst M.D., Late.
GAS CUTTER, Airco #4 & #10 DB Radiagraph.

RADIAL DRILL, 3' 9" Mueller, M.D.
RADIAL DRILL, 4'x11" American, M.D.
RADIAL DRILL, 5'13" Cincinnati-Bickford, M.D.
RADIAL DRILL, 6'x15" Cincinnati-Bickford, M.D.
RADIAL DRILL, 30" Walker Turner M.D., Late
DRILL, Fosdick 16", S.S. Power Feed, M.D.
DRILL, #2 Colburn H.D. #4 M.T., M.D.
DRILL, #121 Baker Auto., S.S. Cam Operated.
DRILL, Deep Hole, Avey-Draulic #2, M.D.
DRILL, Deep Hole, Pratt Whitney #2 Gun Barrel.
DRILL, Edlund #2B, 3 spdle. #2 M.T., 16".
DRILL, 4 & 6 Sp. Avey 12" overhang, #3 M.T., M.D.
DRILL, 4 Sp. Barnes H.D., M.D. #4 M.T., P.F.
DRILL, Cincinnati 21" with Tapping Attach. M.D.
DRILL, Natco Multiple Spdle. #12, #1 M.T., M.D.
DRILL PRESSES, Leland Gifford #1MS, 1, 2, 3, 4.
DRILL PRESS, #2MS Buffalo Forge single spindle.
DRILL, Barnes, 24" S.S. #4 M.T., 1¾" cap.
DRILL PRESS, #25 Foote-Burt S.S. 24", #5 M.T.
DRILLS, #14, #15, #16, #18 Buffalo Forge, M.D.
DEEPFREEZE Motor Products 40 below zero.
DEMAGNETIZER, SB-911 Magnaflux, late type.

FACING HEADS, 20" & 24" Mummert-Dixon.
FILER, #11-S Cochrane Bly Auto Saw Filer.
FILER, #11-S Type P4, Floor Type, M.D. Theil
FURNACE, Westinghouse Elec. 18 KW, 2100° F. cap.
FURNACE, Machler Steam Oven, Serial #3543.

GRINDER, M.D. Sanford Surf. 8"x12" cap., New.
GRINDER, #1 Wilmarth Morman Hand Surf., 6"x12".
GRINDER, #2 Imperial Univ. Tool & Cutter, New.
GRINDER, #2 Brown & Sharpe Sur. 6"x18" cap., M.D.
GRINDER, #4 G & L Univ. Tool & Cutter, M.D.
GRINDER, Disc, Besly #205, 18" Dble. End.
GRINDER, Heald Rotary #25, M.D., 16" Cap.
GRINDER, Cylindrical, Norton 10"x24", M.D.
GRINDER, Brown & Sharpe #4 Univ. 12"x60".
GRINDER, #13 B. & S. Univ. Tool & Cutter, late.
GRINDER, Thread, Jones & Lamson #TG-615, Late.
GRINDER, Heald #72A-3 Internal Size-Matic.
GRINDER, 14"x36" Pratt & Whitney Vert. Surf.
GRINDER, Pratt & Whitney 22"x84" Vert. Surface.
GRINDER, Greenfield #12 Int. Hydromatic, M.D.
GRINDER, Oliver Auto. M.D. Drillpointer.
GRINDER, #33 Abrasive Vert. Auto. Surface, M.D.



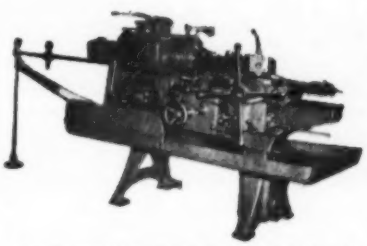
LANDIS 6 x 18 Hyd. Cyl. Grinder, Type C. Serial #29196.

GRINDER, #22 Heald Horiz. Rotary Surface, M.D.
GRINDER, Diamond Snagging 10 HP, 24"x4"x".
GRINDER, #2 Norton Univ. Cutter & Tool, late.
GRINDER, Norton 6x18 Vert. Surface, Hyd. Late.
GRINDER, #60 & #70 Heald Internal.
GRINDER, Landis 6"x18" Hyd. Cyl. late type, M.D.
GRINDER, Sellers Type #1A Tool, 24" wheel.
GRINDER, 37" Wheel Dia. Osterholm Disc, 24" cap.
GRINDER, 30" Ingersoll Tub Face Mill, M.D.
GRINDER #79-72" Gardner Vert. Spindle, Late.
PROFILE GRINDER, Studer Type PSM, M.D., late.
GEAR SHAPER, Fellows #6 High Speed, M.D.
GEAR SHAPER, Fellows #7 High Speed, M.D.

HAMMER, Rochester Hisped, all sizes, M.D.
HAMMER, Bradley 200# Rubber Cushioned Helve.
HEADER, Manville #1 S.S.S.D. Cold 3/16".
INDUCTION HEATER, 15 KVA Ecco Hi Frequency.
INDUCTION HEATER, 30 KW Lepel, Late Type
AIR MOTOR HOIST, Ingersoll Rand 2000# cap.
ELECTRIC HOISTS, 500-4000 lbs. Whiting, NEW.
HOIST, 5 ton capacity Shepard Electric.
HONE, #194 Barnes Vertical, M.D., Hyd. Late.

KEYSEATER, #5 Mitts & Merrill, Giant, M.D.
LAPPER, 2F Norton Vert., M.D., late type.

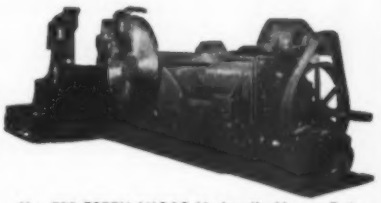
DISC GRINDERS
Osterholm 37" Wheel Diameter Disc Grinder. 40 HP. TEFC 3/60/440 spindle motor drive. 24" capacity.



#4 WARNER & SWASEY Geared Head Turret Lathe, Motor Driven, Bar Feed, Taper Attachment.

LATHE, So-Swing 8"x108", M.D., A.C. Rebuilt.
LATHE, Porter-Cable 9'x15" Geared Head Prod.
LATHE, Hendey 12"x5' Q.C.G. Taper Attach. M.D.
LATHE, LeBlond 14"x6', Q.C.G. M.D.
LATHE, Hendey 14"x8' Q.C.G. Taper Attach. M.D.
LATHE, Lodge & Shipley 16"x6', Q.C.G., Grd. Hd.
LATHE, American 16"x6' Q.C.G., Grd. Hd. M.D.
LATHE, Lehman 18"x7' Q.C.G., M.D.
LATHE, American 18"x10' Q.C.G., Grd. Hd.
LATHE, South Bend 18/28"x8' Gap Bed, Q.C.G. M.D.
LATHE, Hendey 20"x10' Q.C.G., Taper Att. M.D.
LATHE, Reed-Prentice 20"x10' Grd. Hd. M.D.
LATHE, LeBlond 22"x10' Q.C.G., M.D.
LATHE, 24"x12' Boye & Emmes Gd. Hd., T.A., Late.
LATHE, Putnam 23.32"x12' Q.C.G., M.D.
LATHE, LeBlond 24"x14' Q.C.G., Grd. Hd.
LATHE, Lodge & Shipley 26"x14', Q.C.G., M.D.
LATHE, McCabe 26/48"x18' Double Spindle Lathe.
LATHE, Bridgeford 27"x12' Geared Head, M.D.
LATHE, Bridgeford 32"x10' Q.C.G., Grd. Hd.
LATHE, Bullwig Dble. End #VMT5, Devine Bros.
LATHE, Turret #1 Bardons & Oliver Electric Head.
LATHE, Turret, #2 Simmons Vari Drive 220 V.
LATHE, Turret #2 W & S Univ. Grd. Hd., Late.
LATHE, Turret, #4 Warner & Swasey Univ. 1½".
LATHE, Turret #6 Warner & Swasey Grd. Hd. Ram Type, Bar Feed, Motor in base.
LATHE, Turret #2 Cinci. Acme Univ. Geared Head.
LATHE, Turret, #3A Warner & Swasey Univ. M.D.
LIFT TRUCKS, Baker 1 & 2 ton, Platform & Fork.

MILL, #4 Burke Motor Driven, Late, M.D.
MILL, #2 Pratt & Whitney Prod. Duplex, M.D.
MILL, #4B Brown & Sharpe H.D., Horiz. M.D.
MILL, #14 Garvin Plain Horiz., M.D.
MILL, #0Y Brown & Sharpe Plain Horiz., M.D.
MILLING MACHINE, #2B K & T Horiz., M.D.
MILL, Cinci. Horiz. #3, #4, #5 High Power, M.D.
MILL, #1 Brown & Sharpe Plain Horiz., M.D.
MILL, #0-B Cinci. Vert. Prod. Late, M.D.
MLUT-MILLER, U.S. Tool #MM-1-6 Auto. Prod.
MILL, #0 Vernon Hand Mill, M.D., Late.
MILL, 2A Brown & Sharpe Horiz. Univ., M.D.



No. 700 ESPEN LUCAS Hydraulic Heavy Duty Cut-off Saw, new 1945.

MILLING MACHINE, Kempsmith #2 Horiz. Univ.
MILL, #3 Cinc. Univ. Horiz., M.D.
MILLING MACHINE, LeBlond #4 Horiz. Univ.
MILL, #2 Vert. M.D. Brown & Sharpe.
MILL, #3 Cinci. Vertical Hi Power, M.D.
MILL, #3C Becker Vert. Die Sinker, M.D.
MILLING MACHINE, #2 Van Norman Duplex, M.D.
MOTOR GENERATOR SET, Gen. Electric, 100 K.W.

NIBBLER, Gray Turret Type ¼"x24" cap. M.D.
THREADING, Staybolt Lassiter Millholland 1½".
THREAD MILL, 7½x11 Hanson-Whitney, Univ.
THREAD MILL, 6x14 Pratt & Whitney No. 1105.
THREAD MILLER, Lees-Bradner #40A Automatic.
THREAD MILLER, Plan-O-Mill #3 Planetary Form & Thread Semi-Automatic Milling Machine, Late.

PAPER SHREDDER, No. 10 Mitts & Merrill, M.D.
PLANER, Cincinnati 30"x30"x12' A.C., M.D.
POWER PRESS, Bliss #164 Open Back, M.D.
POWER PRESS, Bliss #3A S.S. Dble. Crank Grd. 45 tons, 4" stroke, 36"x26" Bed Area, M.D.
POWER PRESS—Bliss-Consolidated #163-B Straight Side Dble. Crank 45 tons, M.D.
PRESS #5 Johnson OBI, 56 tons, new.
PRESS, #7A Thomas O.B.I. 80 ton cap.
PRESS, #163 Toledo Toggle Drawing, M.D.
PRESS, 135 ton Clearing Single Crank 8" Str., Late.
PRESS, 70H Drake Hyd. Arbor, New.
PRESS, #78½ Bliss S.S. 9½ Str. M.D.
PRESS, Federal #2 O.B.I. Grd. 2" Stro.
PRESS, Bliss #19, #19, #20, #21, OBI. A.C., M.D.
PRESS, Waterbury-Farrel High Speed 60 tons #3W.
PRESS, 68 C Bliss Double Action, 3 crank.
WHEEL PRESS, 300 ton Hyd. Press, 48"x10', M.D.
WHEEL PRESS, Chambersburg 400 tons cap. Hyd.
PRESS, Lucas 15 tons Power Arbor, M.D.
PRESS, #68 Whitney Deep Thr. 24", foot.
PRESS, P2, P3 Ferrazzite M.D. Roll feed.
PANTOGRAPH, #1A Gorton M.D. Engraving.
PUNCH, #46 Buffalo Forge Vert. Cap. 1"x1½" M..D
PUNCH, R-4 Wiedemann Turret, 10 stat. 2¼" thr.
PUNCH, Hecker Turret, 8 station, cap. ½" hole.
PUNCH, H & J #2 Sgle. End. 24" Thr. 1" thru 1".
PUNCH, H & J #5 Sgle. end. 48" Thr. 2" thru 1½".

RIVET BETTER, ½" cap. Penn. Tubular Rivet.
ROLLS, Bertsch Pyramid 18'x1½" cap., M.D., Late.
ROLLS, #1 Buffalo Forge Wrapping, M.D.
ROLLS, 72"x¼" Lown Initial M.D., New.
ROLLS, #2 Buffalo Forge Vert. Angle, Bending, New.

COLD SAW, Wagner 10"x10" cap., M.D.
COLD SAW, Espen-Lucas #700, 48" dia. blade, M.D.
CUT-OFF SAW, Yates-American #M-90, M.D.
SAW, #4B Marvel Hack Saw 6"x6" Cap., M.D.
SAW, #20-C Racine Shear Cut 5"x6" cap., M.D.
SAW, Band, Tannewitz GH-30" High Speed, M.D.
SAW, V-26 DoAll Contour Band, Late.
SHAPER, 16" Pratt & Whitney Crank, M.D.
SHAPER, 20" Rockford Univ. M.D., Tilting Table.
SHAPER, G & E 24", high duty, back geared, M.D.
SHAPER, 32" Cinci. B.G., Motor driven, H.D.
SHAPER, Morton 36" Draw-Cut, 4-Speed, M.D.
SHEAR, #542 Niagara 42"x¼" cap., 15° cap., M.D.
SHEAR, #26 Buffalo Forge Slitting Armor Plate.
SHEAR, Quickwork #11 Rotary 60" Throat, 10 ga.
SHEAR, #8E Niagara M.D. 8'x3/16" cap. M.D.
SCREW SLOTTER, #2 Waterbury Farrel Auto. M.D.
SCREW SLOTTER, #117 Kost, M.D., Late.
SLOTTER, 12" New Haven Vertical, M.D.
SPRU CUTTER, Milwaukee 56 tons, 2½ cap. M.D.
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TAPPER #1 CAM Haskins, Motor Driven, Late.
TAPPER, #1 Bakewell (Warner & Swasey) Late.
BRINELL, Tester Machine, Type UK300M, Steel City.
BRINELL, Tester Machine, Type 03DR, Steel City.

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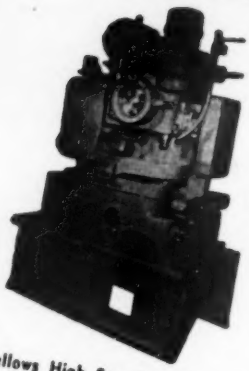
- THE FINEST MACHINE TOOLS
- 3 GENERATIONS OF EXPERIENCE
- GUARANTEED SATISFACTION

CONSULT US WHEN YOU WANT THE BEST!

- AUTOMATICS
- BROACHES
- DRILLS
- GRINDERS
- LATHES
- MILLS
- PLANERS
- PRESSES
- SHAPERS
- MISCELLANEOUS

FOR IMMEDIATE DELIVERY



Type #7 Fellows High Speed Gear Shaper suitable for both spur and helical internal and external gears.

Reconditioned, fully guaranteed.

Available for immediate delivery.

HARVEY GOLDMAN & CO.

3910 SCHAEFER HIGHWAY • DEARBORN, MICHIGAN
TELEPHONE: TIFFANY 6-4450

THE FOCAL POINT FOR PRODUCTION MACHINERY

LATE MODEL MACHINE TOOLS . .

AUTOMATIC SCREW MACHINES
No. RA-4 1⅝" Acme Gridley. 1943
2" Model A Cleveland. 1942
1⅝" Model "A" Cleveland. 1943
1-1/16" Model "A" Cleveland. 1943

BROACHES
HP—100 La Pointe Hyd. Horizontal. 1945
5 Ton 36" St. La Pointe Horizontal. 1942

GEAR EQUIPMENT
No. 7 Gleason "Revex" Rougher. 1943
No. 6 Gleason Revacycle Generator. 1949.
No. 72 Fellows H.S. Gear Shaper. 1942
10" Pratt & Whitney Hyd. Gear Grinder. 1942
Red Ring Universal Gear Checker. 1942
20M Fellows Red Liner Gear Tester. 1942

GRINDERS, CYLINDRICAL
16"x72" Norton Plain Type "C". 1941
16/20x36" Norton Plain Type "C". 1942
14"x168" Norton Plain Type "C". 1942
12"x66" Fitchburg Plain Hyd. 1942
12"x48" Cincinnati Universal. 1942
10"x18" Landis Plain Type "C". 1940
No. 72A3 Heald Plain Hydraulic. 1942
No. 24-36 Bryant Hydraulic. 1943
No. 16 CP 16 Bryant Hydraulic. 1942
No. 16-16 Bryant Hydraulic. 1942
No. 172 Heald Hydraulic. Gap. 1940

GRINDERS, MISC.
No. 600 UK Hanchett Face. 1946
No. 73 Van Norman Radius Grinder. 1942

GUN BARREL MACHINES
No. ½Bx30 Pratt & Whitney Rifler. 1942
No. ½Bx30 Pratt & Whitney Reamer. 1942
No. ½Bx30 Pratt & Whitney Reamer. 1942

LATHES, ENGINE
36"x290" American Geared Head. M.D.
30/46x158 Safop Gap Lathe. New
27"x132" Monarch automatic Sizing. 1942
27"x210" Lodge & Shipley Gap. Lathe. 1940
27"x192" Niles "Timesaver" Lathe. 1941
27"x96" Niles "Timesaver" Lathe. 1940
26"x180" Betts Bridgeford Lathe. 1940
26"x96" Betts Bridgeford Lathe. 1940
25/45x120 Oldfield-Schofield Gap. New

LATHES, PRODUCTION
No. 5D Potter & Johnston Automatic. 1943
8"x84" La-Swing Semi-Auto. 1941
Lipe-Carbo-Matic. Lathe. 1942

LATHES, TURRET
No. 1L Gisholt Universal Saddle Type. 1942
No. 3R Gisholt Universal Saddle Type. 1943
No. H5 Libby Universal Saddle Type. 1939
No. 5W Acme Universal Way Type. 1942
No. 5 Gisholt Universal Ram Type. 1942
No. 4 Midland Universal Ram Type. 1943
No. 3 Gisholt Universal Ram Type. 1942
No. 3R Libby Universal Ram Type. 1942

MILLS
No. 3 Van Norman Plain. 1942
No. 1224 Milwaukee Simplex. 1943
No. 1-18 Cincinnati Auto. 1941
No. M-18 Milwaukee Auto. 1943
No. 1-24 Cincinnati Auto. 1940
No. 2 Alsera Plain Mill. New
No. 2 Baimp Universal Mill. New
No. 2 Baimp Vertical Mill. New

MISCELLANEOUS
No. 2 Bakewell Precision Tapper. 1942
75 HP Gardner Denver Air Compressor. 1945

PLANERS AND SHAPERS
14" Brook Plain Shaper. New
18" Brook Plain Shaper. New
16" Gernetti Universal Shaper. New
20" Gernetti Universal Shaper. New
24" Gernetti Universal Shaper. PRT. New

PRESSES
650 Ton Verson Double Action Eccentric. 1940

Partial Listing — Write for latest stock list

INDIANAPOLIS *Machinery & Supply Co.*

1961 S. Meridian St. • • Indianapolis, Indiana

MUST MOVE PROMPTLY FROM LOCAL CUSTOMER'S PLANT

BEMENT MILES 18" SLOTTER with 3" dia. spindle. M.D.

GOULD & EBERHARD 36" Gear Cutter M.D.

BROWN & SHARPE #5—48" Gear Cutter, M.D.

BINSEE MACHINERY COMPANY HORIZONTAL BORING MILL. Table 30"x64". Quantity of boring bars.

GRAY 36"x36"x8' Planer, 2 heads on cross rail; motor driven. Thoroughly rebuilt and guaranteed.

B & O #2 Turret Lathe 1" Cap. M.D.

FOOTE-BURT #25—24" Heavy duty Vert. Drill #5 M.T. Motorized.

GRINDERS—CYLINDRICAL. B & S #11. 7"x 32". Plain Grinder. Table swivels. Motorized with 4 motors.

LANDIS 10"x36" Plain, M.D. Also Planer type Grinder 16"x36".

"BEMENT" 26" STROKE TRAVERSING HEAD SHAPER. 48" travel to ram. 2 tables. (PLANER SHAPER)

WE HAVE A LARGE STOCK FROM WHICH TO SELECT. TELL US WHAT YOU WANT.

THE OSBORNE & SEXTON MACHINERY CO.

P. O. Box 88 Columbus 16, Ohio

SOME LATE MACHINES STILL AVAILABLE

BORING MILLS

Bullard 24" V.T.L., Spiral Drive
Cleveland 2½" Bar Capacity
Giddings & Lewis #32, 3" #25, 2½" Cap.
King 42", 72" Vertical 2 rail heads
Niles-Bement-Pond 4", 4½" Bar, 60" Vert.
Niles-Bement-Pond 60" Vertical
New 3" Horizontal Boring Mills

DRILLS AND RADIALS

Brand New Radials
American 6'x15" Universal
Baker No. 321 Vertical Boring & Drill
Bausch Multi-spindle
Buffalo #2 Motor Spindle, No. 16 4 Spindle
Buffalo: Power No. 41, No. 42
Canedy-Otto 21" Sliding head New
Cincinnati Bickford 6'x15" col.
Natco #12 20 spindle drill
24" Sibley Sliding head
New Geared Box Col. Drills 24'
Foote-Burt #25 3" capacity
Leland Gifford 2 LMS, 3 MS

NEW VERTICAL MILL

ENGRAVERS

Gorton 3S Die Sinker & Engraving
Gorton #1A, ME. Deckel G1, GK2
Preis—UE3—2 dimensional
Taylor-Hobson 3 dimensional Pantograph
T.M.A.—G2 2 Dim.

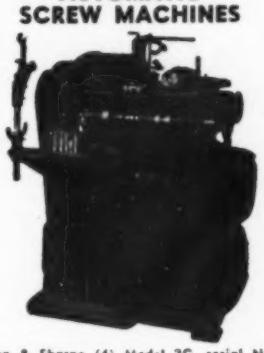
GEAR EQUIPMENT

Barber-Colman Mod. SHS. Sharpener
Barber-Colman #2, #12 (3)
Fellows High Speed Shapers 712, 725, 71, 7
Fellows #20M Redliner
Flather 72" Cutter
Gleason #2 Surface Hardener
Gleason #3 Spiral, #3 Straight Bevel
Gould & Eberhardt 36" Cutter
Michigan Gear Finisher 24" cap., 862-24A
National Broach Red Ring Lapper, Finisher
Schuchardt & Shutte #1 Hobber

GRINDERS, MISCELLANEOUS

B&S #2 Universal 14"x28"
Brown & Sharpe #5, 3"x18" Cylindrical
Bryant #5, internal, chucking, 16A16
Cincinnati 6x18" Hyd. #4—Centerless
Grenby Models 1G1 & 1G2—Internal
Gorton Ped. Type Tool Grinder
Heald #73 Internal Centerless, Sizematic
Heald #81 Internal Gagematic
Heald 72A3 Int. Centerless Sizematic
Landis 6"x30" Type C Cyl., 10x24 Univ. 10x30
Norton No. 2, Tool & Cutter
Norton Type C 6"x18" Semi-Automatic cyl.
Norton 10"x18" Type C cylindrical
Norton 14"x96" cyl., 16x48 Univ.
Norton Roll Grinder 50"x28'
Oliver #510 Drill Pointer
Pratt & Whitney Radius Model R6
Sellers 6T Tool, K.O. Lee tool
Van Norman #666 Crankshaft
Wicaco Internal

AUTOMATIC SCREW MACHINES



Brown & Sharpe (4) Model 2G, serial No's. 8500 & 11500 series, 1¼", 1½" capacity.
Brown & Sharpe (10) Model 0G, serial No's. 9600 & 10700 series, ⅝" capacity.
Brown & Sharpe (6) Model 00G, serial No's. 14, 15, 1600 series, ⅜" capacity.
Ceco Screw Machine ⅜" capacity.
Cleveland, Model AA-11, Serial #36586.
Cleveland, Model B, Serial #42618/843, 1-1/16" capacity.
Conomatic 4 Spindle, Serial 2309FF, 1½"
Conomatic 8 spindle, serial No. 3947VB 1⅝"
New Britain Gridley 61 6 Spindle, Serial No. 25410, 1⅜" capacity.

GRINDERS, SURFACE

New 8x24" Hyd. Feed, 10x18", 6x18"
Abrasive 8x24", #33 Vert. & #34
Blanchard #16, 26" Mag. Chuck
Heald 22—12" chuck, Arter 12"
Norton 6x18" Hydraulic Vertical
Portman 12" Chuck Rotary
Pratt & Whitney 12x36" Vertical
Reid 11x36 Motor in Base
Taft Pierce #1 Precision

LATHES

American 14"x30", Bridgeford 36"x20', 32"x16'
Gisholt Simplimatic 18"x16½", 2 Tables
Hendey 12"x42" and 12x30", 1941, 16x66"
Hendey 14" Yoke Head Lathes
LeBlond Regal 10"x3' bed, 19x42"
Lipe-Carbo 12"x18" (2)
Lodge & Shipley #3A, #3 Duomatics
Pratt & Whitney 16"x6G—Late
New 16, 18, 20", 28" Immediate Del.
New Tool Makers 10x24", South Bend 9"
Reid Small Piece #9WSL
Rivett Model 918 Precision, Mod. 715
Sebastian 12"x4' G.H., Sheldon 12"
Sundstrand 8x15", 15' Stub
Wickes 32"x35' Geared Head

MILLS, PLAIN, UNIV. PROD.

Brand New Universal Mills No. 1, No. 2
Archdale Plain, 14" Production
Brown & Sharpe #3B Plain. Late, 3A, 21, #2L
Cinn. No. 3, 4 Plain Spd., 18" Manufacturing
Kent Owens 1V, 1-8, 1-14, 1M
Kempsmith #1 Pl., Vert. & Div. Hd.
Milwaukee 2K, 2H Univ., 2H Plain.
Milwaukee #2B, Plain & Univ.
Sundstrand #00, 0, Rigidmils
Sundstrand #3A Rigidmil with copying Attach, 33
Van Norman #2L Univ. Dividing Head

MILLS, VERTICAL

Brand New Vertical Mills
Cincinnati 4 Spindle Vertical—Profile
Cincinnati 2 Spindle Hydromatic
Cincinnati (2)—1-18 Plain Automatic
Cincinnati #3, #4 hi-power, 08 Vertical
Cleveland No. 1, table 8"x32"
Morey #12M Profiler, 2 sp.
Pratt & Whitney Profiler 12B, 2 sp.

PRESSES

Bliss No. 1 Double Action Drawing Press
Bliss 645, 650 Hi-Production Presses
Bliss 18, 19, 21, OBI, 58, 62, 162, OB
Bliss 4½ Double Action, Roll Feeds, Cam (2)
Bliss #78½, 330 Ton SS, Bliss 74½
Bliss 5-48 Obi 32x48" bed, Cushion
Hamilton 850 Ton S.S. Bed 27x48
Hamilton 110 FM Die Tryout Press
New 85, 60, 55, 30, 20, 15, 10, 5 Ton O.B.I.
Niagara Herning, 15 Ton
Niagara A1¾, O.B.I., Niagara No. 27
Stokes Table Press, type R, Late
Toledo 92½c Double Crank 43x23" bed
Toledo 29 Double Action Cam
V. & O. #102 O.B.I. Reducing
Walsh No. 3 O.B.I. 23 Ton, LJ #3
Z & H #4½, O.B.I. 20 Ton

TURRET LATHES

Acme 6W Fox 2-9/16" Cap. #2 Cross Slid. Turret
Bardons & Oliver #2, 3, 5, 7, Bar Feed
Brown & Sharpe, #2 Hand, #10, 11
Denver 6 2" Shell Turret (2)
Foster #2B 2½" Cap. Morey #2G Late
Gisholt 2L, Cross Slid. Tur. #5 Bar Feed, Chuck
Gisholt Simplimatic, 18"x16½"
Gisholt 4R—9¼" hole in spindle
Libby 1H5 with threading att.—3R, 4R
Morey #2G Late
Oster 601 WD. #2 Simmons Microspeed
Warner & Swasey #1, #1A, 2, #4 Preselector (2)

MISCELLANEOUS

Band Saw: New, Kalamazoo
Bolt & Pipe Threader: Landis, Oster-Williams #915 Pipe & Nipple Threader
Boring Bar: Underwood 4"
Broach: 3L LePointe Hydro. Horiz. New Klink. 6 Ton, Horizontal, 11 Ton Vertical
Hacksaw: Peerless 6"x6", Racine 6"x6"
Hand Mill: Whitney
Hoist: 5 ton capacity 7½ HP motor
Honer: Micromatic H-4, MC1H
Keyseater Davis, Baker
Oil Groover: WICACO
Planer: Niles-Bement-Pond 36x36'x10'
Rotary Table: Cincinnati, power take-off
Saw: Shaping 6x6", 13x13"
Shapers: 24" Rockford, 24", 28" Gould & Eberhardt. Cinn. 20, 24". Columbia 36"
Shears Power: Obi 10' 3/16", 10" x 16 gauge
Vertical Milling Att. New, Bridgefield
Tapper: Haskins—2CA, Bakewell #2
Welder 50 KVA Eisler Air Operated, New Seam.
Welder: Taylor-Winfield 50 KVA Hi-Wave

New Lathes 16" to 28", Mills, Boring Mills, Broaches, Shears & Presses

HYDRAULIC EQUIPMENT

8 and 9 oz. Injection Moulders
125 Ton Southwark Press, Bed 96"x30". 30" stroke, 2 to 4 ft. opening
150 Ton Triple Action HPM Press
200 Ton W.F. Hobbing Press
250 Ton Watson & Stillman 28x24"
300 Ton Watson & Stillman 24x29"
300 Ton Watson Stillman 20"x20" Platen 8" St. 19" opening
600 Ton Williams & White 42"x60"
800 Ton Williams & White 42"x60"
800 Ton W&S Hobbing Press

All Hydraulic Equipment is completely engineered and checked by a competent staff thus assuring reliability.
Send us your Hydraulic problems.

NEW IN STOCK

Air Hydraulic Presses — Arbor Presses #6C Famco — Band Saws Kalamazoo — Famco 6x12"—Drill Presses all sizes—Hydraulic Press Northern 20 Ton — Injection Molders, 1 ounce — Power Presses, OBI, 1, 4, 4½, 5, 7½, 10, 15, 20, 30, 55, 85 ton—Shapers, 7", 8", 14", 18" Shaperite—Shears, Foot 22" to 8', 16 & 18 ga.—Shears Power 3'x18 gauge to 10' x 10 ga.—Welders Arc Seam Spot all sizes Motors, Grinders, Buffers.

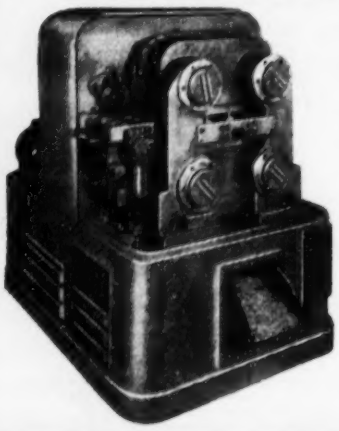
AARON MACHINERY CO., Inc.

This is but a partial listing. Write for free Catalog. Inquiries Invited. HUNDREDS OF OTHERS

AARON MACHINERY CO., Inc., 45 Crosby Street, New York 12, N. Y.
"CABLE—AARMACH N. Y." **Telephone WOrth 4-8233**

LEMPCO "Hypermatic"

50 TON MOTOR DRIVEN HIGH SPEED



PUNCH PRESS

STROKE .10" to 3"

The world's fastest high speed press. It operates at speeds up to 1800 strokes per minute. Stock is fed up to 10,000 lineal inches per minute.

Send for a descriptive catalog covering machine.

RECENT ADDITIONS TO STOCK

BORING MILLS

Bullard 34" New Era Vert. Turret
Gisholt 72" M.D.—2 Hd. Vertical
Gidding & Lewis #80T Horiz. Table type, 2000 RPM spindle speed
Cinn. 10' M.D. 2 Hd. Vertical

GRINDERS

Cinn. No. 4 Centerless, Thru-feed
Blanchard #16A Vertical Surface
Norton 10"x36", 10"x50", 14"x96" Plain
Landis 10"x18" Hyd. M.D. Plain C

MILLERS

Rowbottom up to 32" M.D. Cam Miller
Van Norman 22LU M.D. Univ. Duplex
Potter & Johnson 2M Horiz. Auto.
Brown & Sharpe #3 M.D. Vertical

PRESSES

Henry & Wright 50 ton M.D. Dieing
Toledo No. 666—1000 Ton Coining
Clearing Model DS-1500-60, 500 Ton Double Action Press, 1942 Machine
Cleveland 400 Ton #4K Knuckle Joint

TURRET LATHES

Bardons and Oliver #2-1" Elect. Geared
Gisholt No. 4 Turret Lathe
Potter & Johnson #4D-21" M.D., H.S.
Gisholt No. 5 M.D. Ram Type Univ.

MISCELLANEOUS

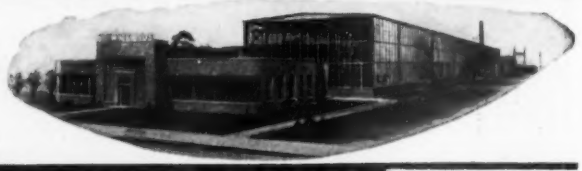
DoAll 16" ML, Metal Master Band Saw
Fellows #72 M.D. High Speed Gear Shaper
Barrett #1200 Fixed Bowl Centrifugal Separator
Bliss 1225A—36" MD Gang Slitter
Dreis-Krump, 10 ft. 10 ga. Gap Sq. Shear
Standard No. 12-1200 lb Belt Drop Hammer
Ajax 1½" and Acme 3" Upsetters

SEND FOR YOUR COPY OF OUR BOOKLET ON OUR REBUILDING

New, Used and Engineered Rebuilt Machine Tools

BOTWINIK BROTHERS INC.

313 WELTON STREET
NEW HAVEN 9, CONNECTICUT



OVER FIFTY YEARS OF RELIABLE SERVICE

IMMEDIATE DELIVERY FROM STOCK

AUTOMATICS

2⅝" CONOMATIC, 6 Spdl., Ser. 2891 SE and 3464 SE, chip conveyor, threading spindle
1⅝" RA6 ACME GRIDLEY, 6 Spdl., Ser. 85013, threading spindle
1⅝" RA6 ACME GRIDLEY, 6 Spdl., Ser. 40603, threading spindle
1" RA6 ACME GRIDLEY, 6 Spdl., Ser. 23455, chip conveyor, threading spindle (2)
9/16" RA6 ACME GRIDLEY, 6 Spdl., Ser. 22965A, No. 22700 AM, chip conveyor (2)
No. 676 NEW BRITAIN CHUCKER, 6 Spdl., Ser. 23003, with chucks
2⅝" MODEL F ACME GRIDLEY, 4 Spdl., Ser. 2769, stock stand, reel
1¾" CONE 4 Spdl., Ser. 33, stock stand, reel
#00 and #2 BROWN & SHARPE, front and rear tool slides

BROACHES

AMERICAN, 6 Ton, 24" stroke, Vertical, Serial #4483, 3 Way, Push, Pull and Surface
AMERICAN 6 Ton, 24" stroke, Vertical, Serial #2984, 3 Way, Push, Pull and Surface
FOOTEBURT, 3 Ton, 40" stroke, Vertical, Dual Ram
LAPOINTE, 7½ Ton, 24" stroke, Model HP, Horizontal

DRILL PRESSES

SNYDER 8gl. Spdl., No. 3 M.T., Dial Type, Powerfeed
BARNES H-3 Spl., Hydram, Vertical
No. 288 EDLUND 8gl. Spdl., No. 2 M.T., NEW

GEAR MACHINERY

#5B FARREL SYKES Herringbone Gear Generator, 61" dia., 1942 Machine
#2A FARREL SYKES Herringbone Gear Generator, 26" dia.
#148 CLEVELAND Rigidhobber, 1945 Machine
#7125A FELLOWS Gear Shaper, Late
#12 FELLOWS Gear Shaver, Late
#18 and #28 GLEASON Gear Quenching Press

GRINDERS

No. A1-12 ARTER Rotary Surface, Serial #1506, with 12" Mag. Chuck
14x30, 17x42, and 17x48 NORTON Crankshaft, with Pot-Type Chucks
#81 HEALD Internal
#72A3 HEALD Internal
#112 RIVETT Internal

LATHES

10x24 JACKSON MELLING Crankshaft Turning
10x32" ATLAS, with chuck and gears
11x30" SEBASTIAN, Chuck and face plate
R-14 SENECA FALLS, Lo-Swing, 10½" swing
GISHOLT SIMPLIMATIC, Air Operated Chuck and Air Cylinder, 34" swing over ways.

PRESSES

#2ET-10-86 BLISS Triple Action Toggle, Capacity of Plunger 650 Ton, Blankholder 400 Ton, Lower Ram 350 Ton, Bed area 62x86, 39" stroke of plunger, 28" of blankholder.
#410A BLISS Double Action Toggle, Capacity of Plunger 525 Ton, Blankholder 290 Ton, Bed area 60x84, 25" stroke of drawing slide, 17" of blankholder slide, D.B.G.
#794 ½B TOLEDO Double Action Toggle, Capacity of Plunger 200 Ton, Blankholder 120 Ton, Bed area 48x72", 18" stroke of drawing slide, 12" stroke of blankholder, D.B.G.
#96-D TOLEDO, Double Crank, S.S., 255 Ton, 6" stroke, 30" shut height, Bed27" bed area.
65, 55 and 38 Ton WALSH O.B.I., NEW, immediate delivery
50 Ton HENRY & WRIGHT Dieing, with Double roll feed, scrap cutter.

MISCELLANEOUS

McKAY ROLLER LEVELLER, ½" to 2" 4 High, 19" dia. rolls x 72" wide (2)
No. 10M2 TISHKEN ROLL FORMER, 10 stand, with AUTOMATIC CUTOFF
A-21 REID THREAD ROLLER, with dies
No. 1 BAKEWELL TAPPER, Serial #712
No. 2G MOREY TURRET LATHE, Serial #T803, with 3 Jaw Chuck
No. 1 WARNER & SWASEY TURRET LATHE, Serial #582800, ⅝" Capacity

PAUL'S MACHINERY CO.

6111 VERMONT AVE. TYLER 7-6300
DETROIT 8, MICH.

IMMEDIATELY AVAILABLE

ROLL FORMING MACHINES

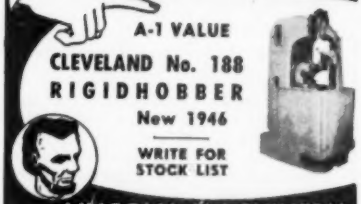
Kane & Roach 15 stand, 30" wide, 4½" dia. shaft 75 H.P. M.D.
Yoder 14" stand, 24" wide, 2½" dia shaft, 25 H.P. M.D.
Tishkin M-2 Ten stand Yoder with AC-2 Cutoff.
Rafter Tube Forming Machines, 5 & 7 Stand.
Yoder 5 stand vertical, with AC-1 Cutoff.

PARTIAL STOCK LISTING

"The most diversified stock of machinery in the country. If it's machinery we have it."

National Machinery Exchange
128 Mott St. New York 13, N. Y.

MACHINE TOOLS



A-1 VALUE
CLEVELAND No. 188 RIGIDHOBBER
New 1946

WRITE FOR STOCK LIST

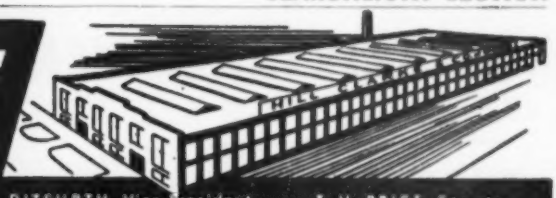
LINCOLN MACHINERY
433 N. LARAMIE AVE. CHICAGO 44, ILL.

NEARLY NEW

GLEASON 3" CHECKER, serial #25080.
GLEASON #7 SHARPENER, serial #24768.

W. C. COWDEN MACHINERY CO.
1207 W. Genesee St., Syracuse 4, New York
Phone 3-7787

HILL-CLARKE MACHINERY COMPANY



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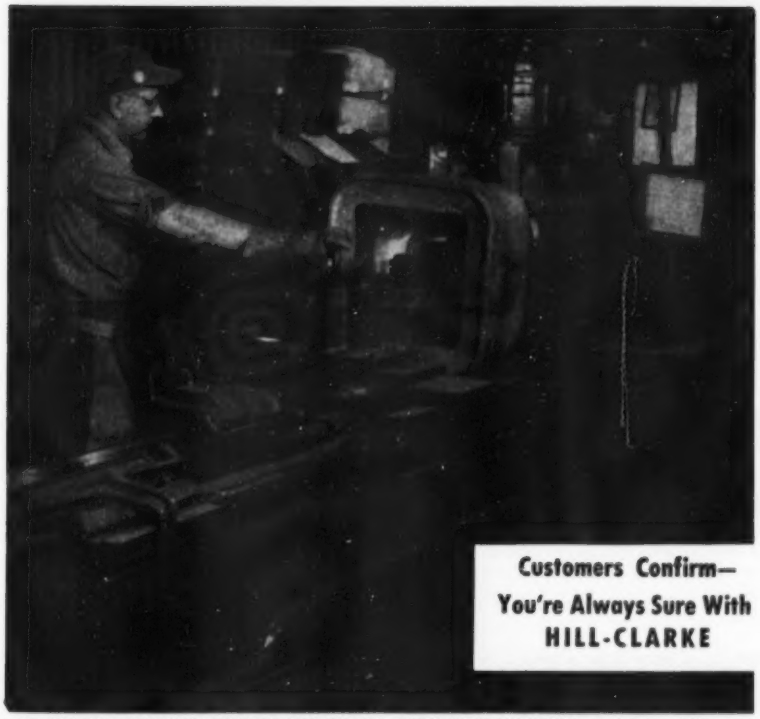

Customers Confirm— You're Always Sure With HILL-CLARKE

THE MAYTAG COMPANY REPORTS TWO-THIRDS GREATER PRODUCTION, easier operation and less maintenance, required with this Hill-Clarke rebuilt lathe. For 38 years MAYTAG has relied on Hill-Clarke for good, dependable used machines like this recess lathe used to center bottom of washer tub so that agitator has same all around bottom clearance.

MILLING MACHINES

54"x30"x16' Ingersoll Slab Mill
6"x168" Pratt & Whitney Thrd. Mill
10"x48" Hanson-Whitney (1942)
12"x102" Lees Bradner Thrd. Mill

PLANERS

36"x36"x12' Cincinnati, 2 hds.
36"x36"x12' Gray, 2 hds.
42"x42"x10' Cincinnati, 2 hds.
48"x36"x14' Gray, 2 hds.
48"x48"x12' Cincinnati, 2 hds.
48"x48"x12' Gray Maxi-Service
60"x48"x27' American, 4 hds.

MISCELLANEOUS

1"-2" Dia. Cap. Micro. Hor. Hone—#200
¼"-1" Dia. Cap. Micro. Hor. Hone—#H-2
42"—18 gage Economy Power Shear
75 Ton R & K Straight Side Press
3 Ton Fox Hydraulic Press
2—12"x96" Magnetic Chucks
20'x1" cap Southwark Roll
14'x¾" cap Niles-B-Pond Roll
15" Dill Slotter
18" Dill Slotter
38" Morton Draw-Cut Shaper (1945)
No. 0 Bakewell Tapper

FULL MONEY-BACK GUARANTEE

1. **Hill-Clarke gives you an unconditional money-back guarantee.**
2. **All machines in stock.**
3. **You can see your machine run and tested under power in our plant before purchasing.**
4. **Complete and modern facilities plus experienced craftsmen for REMANUFACTURING machine tools in our 58,000 sq. ft. plant.**
5. **A responsible organization — with 85 years' experience.**

AUTOMATICS

1-1/16" Model A Cleveland (1942)

DRILLS

1 Spdl—15" Sw—No. 2 Avey, Cam Fd.
1—Spdl—24" Sw—No. 2 MA6 Avey
2 Spdl—24" Sw—No. 2 Aveymatic
2 Spdl—24" Sw—No. 3 Avey
D-31 Fox Multiple Drill, No. 2 Taper.
6' Western Radial

GEAR MACHINES

No. 12HS Gould & Eberhardt Hobber
11" Gleason Bevel Gear Generator
No. 64 Fellows Gear Shaper
No. 36-BM G & E 3 Spdl, Rougher
No. 612-A Fellows Gear Shaper
No. 615-A Fellows Gear Shaper
No. 65 Fellows—Cone Dr.
8" cap Red Ring Gear Lapper

LATHES

12"x21" Fay Automatic
13¾"x39" Centers Dimco Lathe (New)
15"x39" Centers Dimco Lathe (New)
18"x59" Centers Dimco Lathe (New)
23"x60" Centers Dimco Lathe (New)
24"x39" Centers Dimco Lathe (New)
19"x8' LeBlond Hvy. Duty Lathe
36"x18' Putnam Grd. Hd., M.D.
No. 4R Libby Turret (1942)
No. 4 Warner & Swasey Tur.-Bar Fd.
5W Acme Ram type Tur., 2" Capacity
No. 6 Warner & Swasey Tur.-Bar Fd.
18" Libby Tur. Lathe, M.D.
No. 3AL Gisholt
No. 4A Warner & Swasey—7⅛" Hole—Spdl.

GRINDERS

6"x18" Norton Cylindrical (1943)
Hill-Clarke Norton Type Motor Driven Grinders
10"x36" centers
10"x50" centers
10"x72" centers
10"x96" centers
14"x36" centers
14"x72" centers
20"x96" centers
24"-32" Gap x 144" centers
No. A-3—12" Arter Rotary Surf.
5A Bryant Internal
5B Bryant Internal
No. 16-16 Bryant Internal Grd.
No. 16-28 Bryant Internal Grd.
No. 24-26 Bryant Internal Grd.
No. 81 Heald Centerless Internal
No. 74 Heald Internal Centerless

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DETRICK & HARVEY 48"x48"x16' 4 heads; hydraulic table feed and clapper box lifts.

GRAY 36"x36"x10' double housing—"Maximum Service"; 4 heads, rapid traverse; box table.

LIBERTY 144"x76"x48' adj. Convertible open-side; 4 heads; rapid traverse.

NILES 48"x48"x10' double housing "Time-Saver" 4 heads; box table; rapid traverse.

NILES BEMENT POND 60"x60"x12' double housing; 3 heads; box table; rapid traverse.

NILES BEMENT POND 72"x72"x30' double housing; 4 heads; box table; rapid traverse.

NILES BEMENT POND 108"x84"x42" double housing; 4 heads; box table; rapid traverse.

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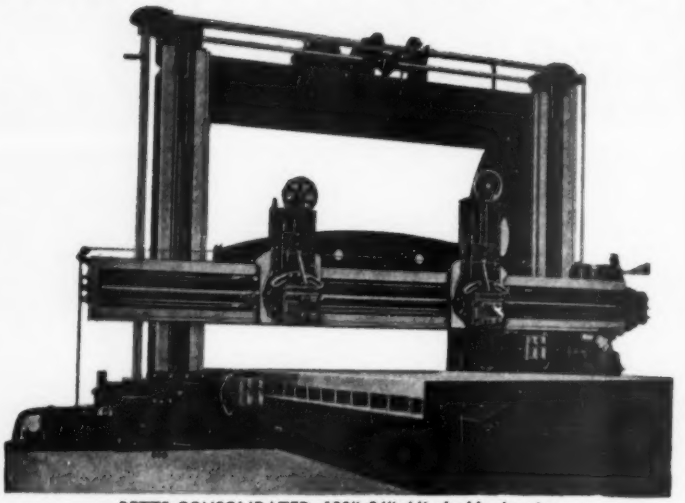

BETTS-CONSOLIDATED 108"x84"x44' double housing Planer—4 heads; box table; rapid traverse.

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Cleveland 6 Spindle Automatic Chucker, 4¾" capacity.

Leland-Gifford 2LMS 6 Spindle Drill Press with back gears and power feed to all spindles.

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LATE MODEL TOOLS

American Type T-8-32 Broaches Three-way vertical hydraulic, single ram, 13"x18" table. Cap. 12,000#. MD with 7½ HP motor. 1942.

Barrett 1 ton Portable Shop Elevator Hinged type. Never used. Half price.

No. 320 "Barnesdrill" Multiple Cyl. Hyd. Hone, throat—16¼", spindle stroke 2" to 20", 5" dia. spindle. Sleeves with #4 taper. 1948.

R.A.VINE, INC.
new and used machinery

652 W. Willis Ave., Detroit 1, Mich.

P. & W. 30" 2-Spindle Vert. Profiler
Fellows Straight Line Gear Generator
Hardinge Model MD-37 Lathe, ⅛" cap.
P. & W. 4½" x 36" Thread Mill, 1941

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L. D. (Long Distance) 65
ROCHESTER 1, NEW YORK
Explosion Proof Motor Headquarters

1941-1952 MACHINE TOOLS

IMMEDIATE DELIVERY — NO PRIORITIES NEEDED

CAM MILLERS

VAN NORMAN: 10CT Contour Miller, horizontal opposed spindle type for milling flat cams, also can be converted to similar work

CUTTER & TOOL GRINDERS

FELLOWS: Flat Top Helical Gear Cutter Grinder
OLIVER: 10" Template Tool Bit
RANSOM: 2-Wheel Grinder 3 HP
RUSSELL: 40" Saw Sharpener (New), automatic indexing

DRILLING MACHINES

ALLEN: #2 High Speed, 15" overhang
CINCINNATI-BICKFORD: 1¼" upright
PRATT & WHITNEY: ½B x 50 Deep Hole Reaming Machine

GEAR CUTTING MACHINES

BROWN & SHARPE: No. 6 Gear Cutter, 72" diameter, 1¾ D. P. capacity
CLEVELAND: Model 130 Gear Hobber (like new)
CLEVELAND: Model 140 Gear Hobber (like new)
FELLOWS: 61A Shaper, 18" dia.
FELLOWS: 64A Shaper, 18" dia.
FELLOWS: 72 Shaper, 7" dia.
FELLOWS: Flat Top Helical Gear Cutter Grinder
FELLOWS: Straight Line Generator, 3" dia. with many cutters
GLEASON: #12 Rough & Finish Gen.
GLEASON: 3" Straight Bevel Gear
GOULD & EBERHARDT 96", Universal, motor-driven
SYKES: Gear Shaper 14" external, 20" internal (New)
SYKES: Rack Cutting Machine 12" to 36" length capacity (New)

GEAR AND SPLINE GRINDERS

PRATT & WHITNEY: 10" single and double wheel, hydraulic feed
GEAR GRIND MACH: GG-19, 10"x 24" Hydr. Spur Gears and Splines

GEAR FINISHERS & TESTERS

FELLOWS: 8 LSI and 13 LSI Gear Lappers, external and internal spur and helical
FELLOWS: #12C Cone & Spacing Inspection Instrument
GLEASON: No. 4 and No. 6 Bevel Gear Testers, Hand and Power
NATIONAL BROACH: SIC-12" Red Ring Gear Testing Machine

GRINDERS—CYLINDRICAL

BROWN & SHARPE: No. 10 capacity 6"x18" plain
CINCINNATI, 6"x18" Hydraulic, Plain
LANDIS: 16x32" Type "D" Crankpin, hydraulic, for grinding crankshafts
LIDKOPING: Centerless (New)
NORTON: 10"x18" 45° angle wheel

GRINDERS—GEAR & SPLINE

GEAR GRIND MACH.: GG-19, 10"x 24" Hydr. Spur Gears and Splines
PRATT & WHITNEY: 10" single and double wheel, hydraulic feed

GRINDERS—INTERNAL

BRYANT: No. 5Y Internal
BRYANT: 16C16 Hole, Hydraulic
HEALD: 72A3 Sizematic Centerless

GRINDERS—RADIUS

VAN NORMAN: #73, capacity 7⅛"
VAN NORMAN: #639, capacity 7"
VAN NORMAN: #649, capacity 6" to 16" diameter
VAN NORMAN: #3½ Un. Radius

GRINDERS—SURFACE

ARTER: A-1—8" Rotary
HEALD: 8" Rotary
HEALD: No. 22 Rotary—12" Chuck

GRINDERS—THREAD

EXCELLO: #31 External, dia. 5"x18"
JONES & LAMSON: #636 Universal, 6" dia. x 36" centers

HONING MACHINES

BARNES: No. 306H Vertical 24" Stroke
MICROMATIC: H-510 Double End Horizontal, ¾" to 2" dia.
MICROMATIC: H-2 Single End Horizontal, 2-spindle, ¼" to 1" dia.

JIG BORING MACHINES

PRATT & WHITNEY #1 Jig Borer
SWISS #5B Jig Borer
LINDNER #14 & #15 Jig Borer, new

LAPPING MACHINES

FELLOWS: 8LSI and 13 LSI Gear Lappers, external and internal spur and helical
NORTON: No. 26 Hyprolaps, for flat work & Cylindrical lapping.

LATHES PRODUCTION

BLOUNT: Polishing speed lathe 12" dia. x 48" centers
REINECKER Relieving Lathe (new)
H.E.B.: High production hydraulic duplicating and copying lathes (new)
LE BLOND: Regal, 15" swing x 42" centers
LODGE & SHIPLEY: #3A Duomatic. 25½" swing x 27" centers
MONARCH MONOMATIC: 14"x48" Copying Lathe, with air tracer
30"x23' Centers, latest type, new engine lathe
POTTER & JOHNSTON: #6 DREL Automatic
PROGRESS: Geared head 16" to 30" swing (New)
TRIPLEX: 14" dia. x 40" centers Toolroom Lathes (new)
VDF New Engine Lathe 49" swing x 20' centers
VDF New Engine Lathe 27" swing x 23' centers

LATHES—TURRET

SCHIESS: 41", 65" and 79" Vertical Turret Lathes (New)
WARNER & SWASEY 2A Turret Lathe
WARNER & SWASEY #3 Turret Lathe
BULLARD: 84" Vertical Turret Lathe
HERBERT: #2, #4, #7, and #8 Sizes (new)
WEBSTER & BENNETT: Vertical Turret Lathes 36" & 48" (New)

MILLING MACHINES

TAYLOR-FENN: M-80 Duplex Spline
RICE-BARTON: Duplex Spline
VAN NORMAN: 10CT Contour Miller, horizontal opposed spindle type for milling flat cams, also can be converted to similar work.

PRESSES

Gen. FLEX: Screw Press, 3 ton
LOGAN: 5-Ton Vertical Hydraulic Press

SAWS & CUT-OFF MACHINES

CAMPBELL: No. 425 Cutalator Abrasive Cut-Off, 4½" dia. capacity
MOTCH & MERRYWEATHER: No. 3 Circular Saw with auto. stock feed
RUSSELL: 9½" cut-off Saw with Auto. Stock Feed (New) Hydraulic
RUSSELL: 5½" dia. cut-off saws, auto stock feed, hydraulic (New)

SHAPERS

HERCULES: 16" & 22" Shapers (New)
KLOPP: 16" to 26½" Shapers (New)

THREAD MILLERS & TAPPERS

HALL PLANETARY: Model "D" Thread Miller
LANDIS: 2½" single head horiz. threading machine
LEES-BRADNER: 40A Thread Miller
MURCHEY: #22 Horizontal threading and tapping machine, ½" to 2½" dia. capacity, single spindle
NATCO: Vertical Tapper 16 spindle

WIRE FORMING MACHINES

BAIRD: 4-slide wire former.
HEENAN & FROUDE: Wire forming, 4-slide machines (new)

MISCELLANEOUS

CUTOFF: Campbell, abrasive 425 Cutalator 4½" dia. Capacity
RACK CUTTING MACHINE: Sykes 12" to 36" length capacity (New)
CUT-OFF: Russell 5½ & 9½" cut-off saws with auto. stock feed (new) hydraulic
PRESS: Screw. Gen. Flex. 3 ton
TEST STAND: Denison 918-AM Hyd.
LATHES: Blount Polishing Speed Lathe, 12" dia. x 48" centers
GOGAN BRINELL Hardness Tester Model 16-J
SHAPERS: Klopp 16 to 26½" (New)
SHAPERS: Hercules 16" & 22" (New)
SUNDSTRAND: 44" Double End Centering Machine
WIRE FORMING MACHINES: 4-slides (new)

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LAURENS late models

Selections from our Large Stock of Modern Machine Tools

fully guaranteed

ENGINE AND PRODUCTION LATHES

1—12" x 30" centers, Model CK MONARCH Tool Makers lathe, taper attach. Collet Chuck, 3 and 4 Jaw Chucks, New 1943.
1—unused HEID 17" x 78" centers Heavy Duty Engine Lathe, new 1951.
1—30" x 14' bed AMERICAN TOOL WORKS Heavy Duty Engine Lathe, taper attachment.
7—No. 4 GISHOLT Second Operation Production Forming, Facing and Cut-off Lathes, new in 1947/48; with front and rear slides, hydraulic chucking, spindle hole 4½".
2—20" x 25" FAY Automatic Lathes, 1939/40.
1—Model U SENECA FALLS LO-SWING 14" x 24" Automatic Lathe, new in 1940.
3—Gisholt Simplimatic Platen Type Production Lathes. With much tooling.

TURRET LATHES

1—#1 WARNER & SWASEY Electric Head, 1" bar capacity.
2—#4R LIBBEY Univ. Ram type, for chuck work.
1—#7 BARDONS & OLIVER Univ. Ram type, for bar work 2½" cap. Late machine.
1—Model No. 4H-8 LIBBY Heavy Duty Saddle type, new in 1940, 8¼" hole, 32" swing.
2—1 FU Foster "Fastermatic" automatics, 1942.

VERTICAL TURRET LATHES

1—36" BULLARD spiral drive, new 1940. Rebuilt.

AUTOMATICS

Model A 1-1/16" CLEVELAND single spindle.
2—Model B 1½" CLEVELAND Single Spindle Automatic, new 1943. One is 18" shaft mach.

MILLING MACHINES

1—Model 3VG High Speed REED PRENTICE Vertical Mill and Die Sinker, new 1940.

CYLINDRICAL GRINDERS

1—3"x18" (#5) BROWN & SHARPE, late.
1—14"x36" Type CD NORTON with plunge cut and spark splitter, 1941.
1—14" x 48" CINCINNATI Self-contained Plain Grinder, 1940; with filmatic bearings.

INTERNAL GRINDERS

Several—No. 5B, 16, No. 16A28, No. 16/22 & No. 24/26 BRYANT Internal Grinders.
1—No. 81 HEALD Sizematic-Gagematic Combination.
1—Model No. 72A-3 HEALD Electric Indicator Automatic Internal Grinder, 1942.
1—72-A3 HEALD Sizematic, 1943.
2—No. 172 HEALD Hydraulic Internal Gap Grinders; new 1941/42; cross sliding and swivel workhead, swing in gap 40".
1—No. 73 HEALD Internal Grinder.

SHAPING MACHINES

1—32" GOULD & EBERHARDT heavy duty Shaper.

AND A LARGE VARIETY OF FINE TOOL ROOM AND PRODUCTION MACHINE TOOLS

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Tools Machine

LAURENS BROS., INC.

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BORING MILLS

No. 0 G&L Horizontal Boring, Drilling and Milling Machine
No. 32 LUCAS Horizontal Boring, Drilling and Milling Machines
36" BULLARD Vertical Turret Lathe
100" BETTS Vertical Boring Mill, Late

DRILLS

3'9" CINCINNATI BICKFORD Hi Spd Radial, '41
32" CINCINNATI BICKFORD Upright Drill
No. ES NATCO Multi Spindle Drill—Hyd. table, '42
No. 42S BAKER B.S. Heavy Duty Drill
No. 2MS LELAND GIFFORD 4-spindle Drill

GEAR EQUIPMENT

Nos. 64, 72 & 725A FELLOWS High Speed Gear Shapers
No. 12 FELLOWS Gear Shaver, 1943
No. 36BM GOULD & EBERHARDT Gear Rougher

GRINDERS

No. 5 B&S 3"x12" Plain Grinder
6"x18" CINCINNATI Plain Hyd. Cyl.—Filmatic
6"x18" LANDIS Type C Plain Grinder
6"x18" NORTON Vertical Spindle Surface Grinder
10"x24" LANDIS Universal Grinder
10"x72" LANDIS Type C Hyd. Pl. Grinder—'42
14"x48" CINCINNATI Plain Grinder, Filmatic, Late
No. 104 RIVETT Internal-External Grinder
No. 73 HEALD Internal Centerless Grinders
No. 172 HEALD Internal Grinder

LATHES

14"x6' HENDEY Model ECM M.D. Engine Lathe
16"x30" LODGE & SHIPLEY Toolroom Lathe, '41
20"x10' LODGE & SHIPLEY Selective Geared Head
27"x14' ea LEBLOND HD Engine Lathe, '42
30"x16' bed AMERICAN "High Duty" Geared Hd
42"x25' ea AMERICAN "Super Productive" GH Lathe—two carriages

MILLERS

Nos. 0-8 CINCINNATI Plain & Vert. Milling Mach.
Nos. 1-8 & 1-14 KENT OWENS M.D. Production Millers
Model MM-5 U.S. Multi-Miller
No. 2 B&S Pl. Light Type Miller
No. 2M CINCINNATI Vertical Miller 1941
18" CINCINNATI Mfg. Knee Type Milling Mach.
4½x36" P&W Model C Thread Miller
36"x36"x16" INGERSOLL Planer Type, 3 heads
36"x36"x12" INGERSOLL Planer Type, 3 heads, Late

AUTO LATHES & TURRETS

No. 2 B&S Wire Feed Hand Screw Machine
No. 2 W&S Geared Friction Hd. Turret Lathe
No. 3A W & S Univ. Hvy. Dty. Saddle Type Thr. Lathe
No. 3 J&L Ram Type Universal Turret Lathe
No. 1L GISHOLT Saddle Type Turret Lathe, 1947
Nos. 4D & 6S POTTER & JOHNSTON Auto.

WIGGLESWORTH INDUSTRIAL CORP.

203 BENT ST., CAMBRIDGE 41, MASS.-KIRKLAND 7-5242

IMMEDIATELY AVAILABLE

4—LIBBY 1H5 Turret lathes. Manufactured 1940-41. SERIALS 642-1028. 839-1241. 1039-142A. 1241.
PRICE ..... EACH $7200 FOB

1—LIBBY 1H6 Turret. SERIAL 129A.
PRICE ..... $8750 FOB
Excellent condition with extensive equipment.

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MODERN MACHINES

72" RECONDITIONED King Heavy Duty Vertical Boring and Turning Mill—Serial Lot 38—$175
Late Type Reconditioned 9¾" Bar Defiance #5A Table Type Horizontal Boring, Milling, Drilling and Tapping Machine—Serial #870-38
Ingersoll Adjustable Rail Planer Type Milling Machine—Serial #3158.
#64 Fellows Gear Shaper, Ser. #26113
#64A Fellows Gear Shaper, Ser. #25634
6' American Radial Drill, Ser. #55592
60" Hanchett Face Grinder
6D Potter & Johnston Automatic Chucking Machine
18" Gould & Eberhardt Shaper, Ser. #867A7
Cincinnati #3 Miller—Ser. A1604-B
Onsrud Pin Router, Serial #2825
20" Knight Rotary table—Motor Driven

HAZARD BROWNELL MACHINE TOOLS, INC.
350 Waterman St., Providence, R. I.

MACHINE TOOLS

LATE TYPE
RIVETT NO. 608-PV
Screw Cutting Tool Room Lathe

MOREY 2G
HAND SCREW MACHINE

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PRODUCTION MILL

CINCINNATI Horizontal 24"x96", with Timken Bearings, Hydraulic.

ENGINE LATHE

BRADFORD 16" x 8 ft, 1946

Linn MACHINERY COMPANY
160 N. HALSTED ST. CHICAGO 6, ILL.

NEW LATHES AT BARGAIN PRICES

New 18" x 80" Centers MEUSER LATHE and 24" x 120" Centers MEUSER LATHE. Complete with Taper Attachments, Chucks and all equipment. *GAP BED TYPE.* Available from stock all sizes up to 32" Swing. Will trade for other equipment.

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MONA MOWERS

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ELECTRIC FURNACE TO 1850°

8 x 12 x 15 inside with Auto. Temperature Control 4.5 K.W. Sliding door, cheap to operate. Substantial. Dependable for Machine Shop—Tool Room. New. $250.

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VERTICAL BORING MILLS

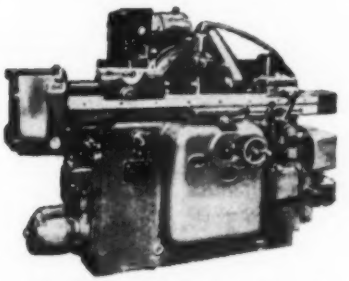
72" BETTS & 100" BULLARD
2 swivel heads, M.D., first class condition

BRANDT MACHINERY COMPANY
Serving Industry Since 1908
514 Empire Building, Pittsburgh 22, Pa.

NEW and LATEST TYPE REBUILT MACHINE TOOLS FOR SALE or LEASE

LATHES

MONARCH Model EE 10"x20" Toolroom Lathes
MONARCH Model N G.H. Engine Lathe 33½"x120" cc
LODGE & SHIPLEY G.H. Engine Lathe 24"-27"x16' cc
AMERICAN G.H. Engine Lathe 24"-27"x96" cc
AXELSON G.H. 24-Sp. Engine Lathe 16"x54" cc
LEHMANN G.H. 16-Sp. Engine Lathe 18"-20"x82" cc
AMERICAN G.H. Engine Lathe 16"-18½"x30" cc
MONARCH Model 5T Multi-Tool Mfg. Lathe 12"x18" cc
HARDINGE 2nd Operation Lathe 1" Cap.



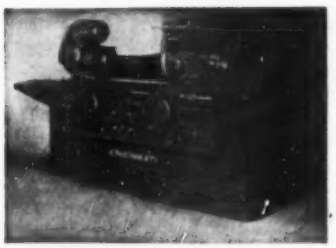
JONES & LAMSON MODEL TG 12 x 45"
AUTOMATIC THREAD GRINDER

TURRET LATHES

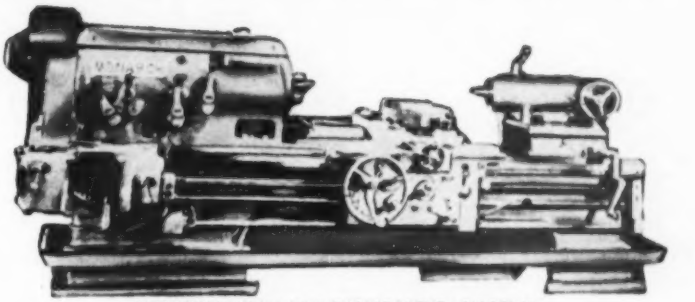
WARNER & SWASEY Mod. 2 G.H. Ram Type 1" Cap.
WARNER & SWASEY Mod. 2 G.H. Ram Type 1½" Cap.
BARDONS & OLIVER Mod. 2 G.H. Ram Type 1" Cap.
BARDONS & OLIVER Mod 3 G.H. Ram Type 1½" Cap.
WARNER & SWASEY Mod 3 G.H. Ram Type 1⅛" Cap
GISHOLT Mod 3 G.H. Ram Type 1½" Cap.
WARNER & SWASEY Mod 5 G.H. Ram Type 2½" Cap.
GISHOLT Mod 5 G.H. Ram Type 2½" Cap.
FOSTER Mod 1B Univ. G.H. Saddle Type 2-9 1/16" Cap.

GRINDERS

BROWN & SHARPE Model 2 Internal-External Universal Grinder 14"x30" Cap.
CINCINNATI Uni. Hydr. Cyl. Int.-Ext. Grinder 12"x36" Cap.
ROTOREX Model 101-A Universal T & C Grinder, w/Int. Att.
COVEL Model 91A Univ. T & C Grinder
JONES & LAMSON Model TG-12x45" Auto. Thread Grinder
EXCELLO Model 35 Thread Grinder
EXCELLO Model 31 Thread Grinder



CINCINNATI 12" x 36" HYDRAULIC UNIVERSAL GRINDING MACHINE INT. EXT.



MONARCH 33½" x 120" ENGINE LATHE—MODEL N

LAPPING MACHINES

ULTRALAP Model 10 Vert. Lapper

TAPPING MACHINES

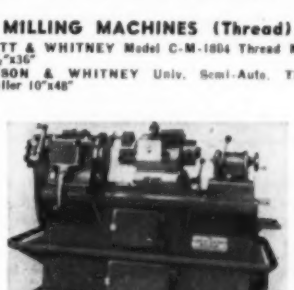
BAKEWELL Model 2 Tapper ¾"—2½" Cap.

MILLING MACHINES (Horizontal)

VAN NORMAN Model 36 Ram Type Duplex
NEW CENTEC Model 2A Universal With Vert. Att.
MILWAUKEE No. 1-B Universal Miller
BROWN & SHARPE Mod 10 Auto. Production Miller
CINCINNATI Mod 08 Plain Horiz. Auto., Cycle

MILLING MACHINES (Thread)

PRATT & WHITNEY Model C-M-1804 Thread Miller 4½"x36"
HANSON & WHITNEY Univ. Semi-Auto. Thread Miller 10"x48"



HANSON & WHITNEY UNIVERSAL SEMI-AUTOMATIC THREAD MILLING MACHINE
10" x 48"

MISCELANEOUS

FAMCO #6, 8, 10, 12, 15 Foot Presses (NEW)
EXCELSIOR #6, 8, 10, 12, 15 Foot Presses (NEW)
ARBOR PRESSES (NEW)

VERTICAL MILLER

GORTON Model 6D Super Speed Vertical Miller

PRESSES

WIEDEMANN Model R11P 16 Sta. Power Turret Punch
RUESCH #2 Percussion Press
POWER PRESSES (New)

AUTOMATICS

BROWN & SHARPE Model 00G ⅝" Cap.
CLEVELAND Model A Single Spindle 9/16" Cap.
CLEVELAND Model A Single Spindle 1-1/16" Cap.
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CLEVELAND Model B Single Spindle 1⅛"—1⅜" Cap.

BORE-MATICS

EXCELLO Model 2112A Single End Double Spindle Hyd. Cross Slide Table

DRILLS

NEW O. M. S. R. Type T.B. 2 Radial 4'x12" Column
NEW ZEWO Universal Floor Type Radial 21"x1½"
NEW CANEDY OTTO 18" Single Spindle ⅞" Cap.
NEW FAMCO 15" Bench Type Drill Presses ½" Cap.
NEW FAMCO 18" Floor Type Drill Presses ½" Cap.
MORRIS MOR-SPEED RADIAL 3'x9" Column
LELAND GIFFORD 2 Spindle 20" Drill Press

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BARBER-COLMAN Type 5 Gear Hobber
FELLOWS 3" Fine Pitch Shaper
GLEASON 12" Straight Bevel Generator—Finisher—Rougher
GLEASON 3" Straight Bevel Generator
GLEASON 3" Spiral Bevel Gear Generator
GLEASON 3" Bevel Gear Tester
GLEASON Model 6 Angular Hypoid Tester
GLEASON 10" Spiral Bevel Generator
BARBER-COLMAN Model 12 Hobber 12" Cap.

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PRATT & WHITNEY 40-Inch Profiler 2 Side Heads
PRATT & WHITNEY 30" Single Spindle

SHAPERS

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GOULD & EBERHARDT Industrial Shaper 20"

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No. 5 GISHOLT Universal Turret Lathe, pre-selector head, bar & chuck, new 1943.

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No. 4 KEARNEY & TRECKER Plain Horizontal Mill, No. 50 taper, motor in base, rapid traverse.

5'-13" column CARLTON Radial Drill, AC motor in arm, 15-1500 RPM, box table.

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BORING MILL, 72" King, 2 Hds., P.B.T., M.D.
BORING MILL, 72" N.B.P., 2 Hds., P.R.T., M.D.
BORING MILL, 3½" bar Defiance, Table Type
BORING MILL, 3½" bar Giddings & Lewis #9
BORING MILL, 3" bar Lucas, Table Type
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5' Amer., 14" col., Trip. Purp.
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4'11" col. Cinci. Bickford
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#3¼ Baker, 24", 3" capty.
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#2LMS Leland Gifford, Deep Hole
FLANGERS, ¾" and ½" McCabe (2)
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16"/32"x8' Harrington Gap M.D.
16"x6' & 12"x8' Headoys (2)
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No. 3AL Gisholt, 6¼" H.S.
No. 3 Gisholt, 1942
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MILLERS, Nos. 2 & 3 Cinci. HI Power Univ., M.D.
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MILLER, No. 2 Van Norman Ram, M.D.
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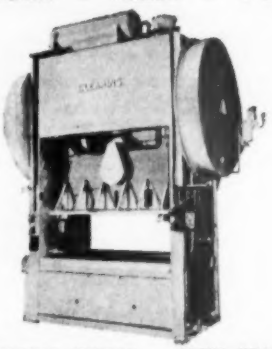

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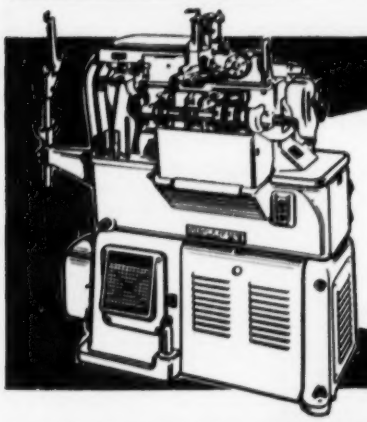

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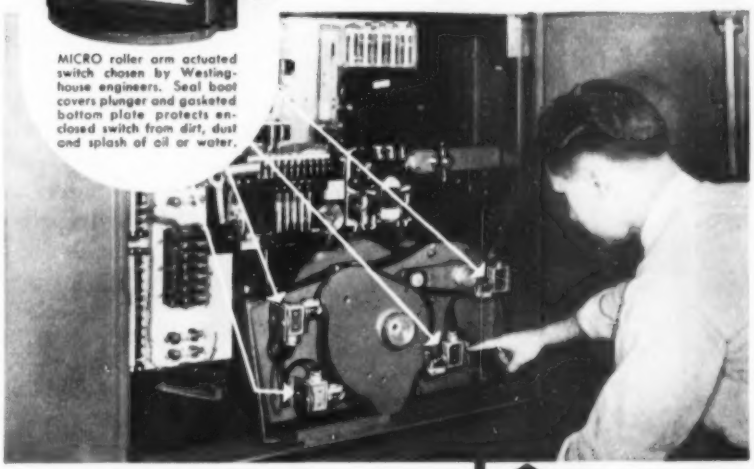
Westinghouse...aided by MICRO... brings new efficiency to automatic gear hardening

MICRO roller arm actuated switch chosen by Westinghouse engineers. Seal boot covers plunger and gasketed bottom plate protects enclosed switch from dirt, dust and splash of oil or water.



So speedy and efficient is this Westinghouse INDUCTALL gear hardening machine that a battery of five of them is capable of heat-treating up to 300 gears an hour.

For automatic control of the vital handling, heating, quenching and unloading, Westinghouse selected four MICRO precision switches. This selection was prompted by their precise, long-life, trouble-free performance, ease of mounting and water-tight connections provided.

Choice of MICRO switches as components for this rugged machine tool is typical of the confidence placed in MICRO design and performance by design engineers throughout the machine tool industry.

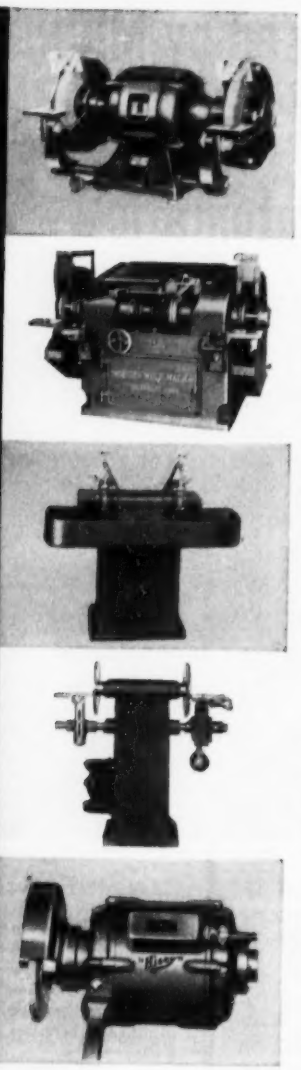
MICRO field engineers, with wide experience in the switch requirements of machine tool design, are located near you. They are ready and willing to assist in the selection of the MICRO switch best suited to your specific requirements . . . or help in the development of an entirely new switch if this is indicated. Write or call your nearest MICRO branch office.

Westinghouse engineer points to one of four MICRO precision switches which are operated by cams to provide completely automatic operation of the handling, heating, quenching and unloading of gears in the Westinghouse INDUCTALL gear hardening machine.

Exterior view of Westinghouse INDUCTALL gear hardening machine which shows the clean, compact design of this modern machine tool for mass-production gear hardening.

MICRO MAKERS OF PRECISION SWITCHES
FREEPORT, ILLINOIS

A DIVISION OF MINNEAPOLIS-HONEYWELL REGULATOR COMPANY



.....and they lived happily ever after.

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The "HISEY" line is unusually complete comprising a wide range of sizes and types including Drill Grinders, Disc Grinders, Wet Grinders and others for various sharpening, snagging, finishing and fitting operations.

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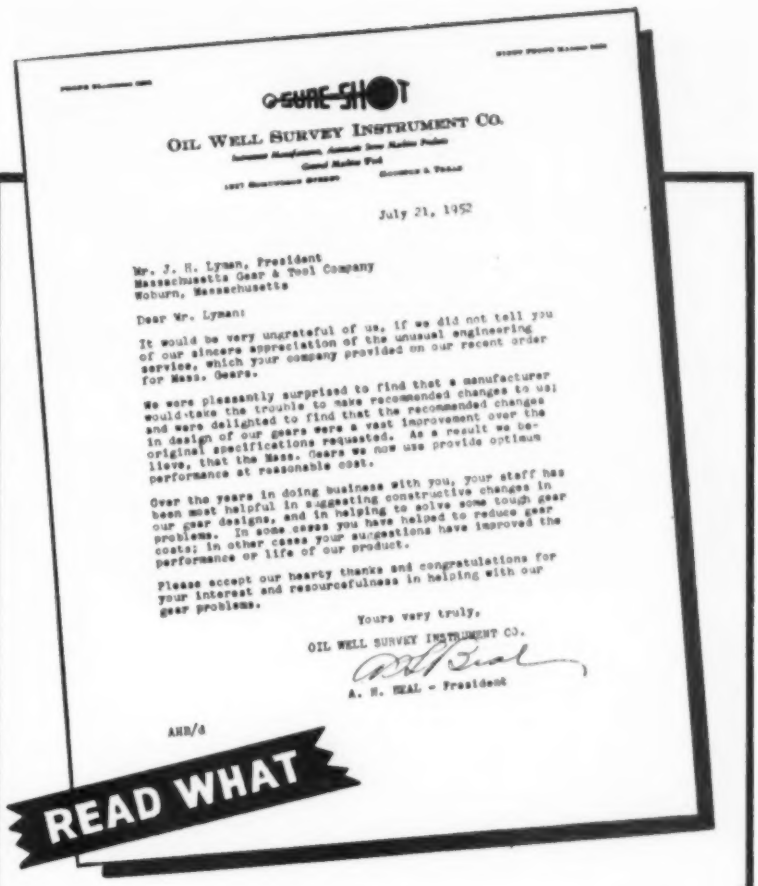
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We were pleasantly surprised to find that a manufacturer would take the trouble to make recommended changes to us; and were delighted to find that the recommended changes in design of our gears were a vast improvement over the original specifications requested. As a result we believe, that the Mass. Gears we now use provide optimum performance at reasonable cost.
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Please accept our hearty thanks and congratulations for your interest and resourcefulness in helping with our gear problems.
Yours very truly,
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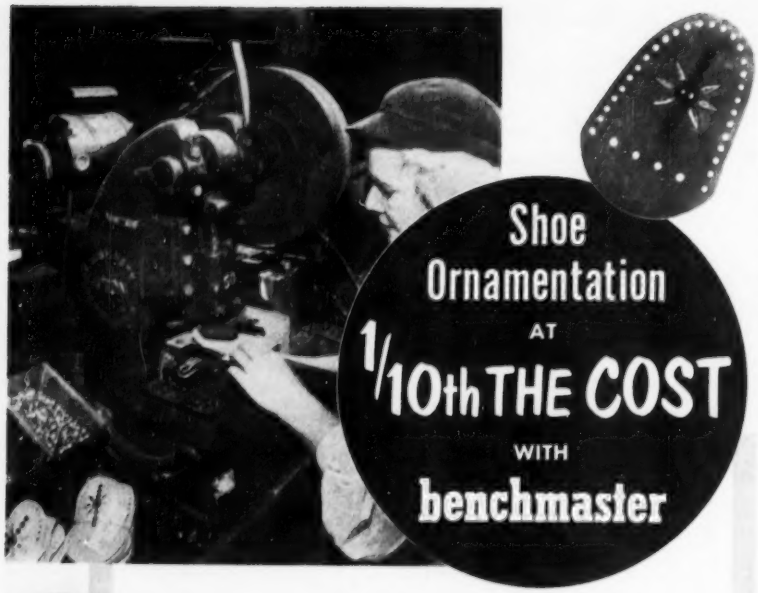

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Use your air rights...

on pier, in plant, outside or warehouse-wide... let Towmotor stack space-eating loads, up where you've storage capacity to spare. Speeding the handling of *all* materials, Towmotor saves its cost in a matter of months—then *you* profit by that big earning power throughout many busy years. You'll see the proof, right from the start, in stepped-up output per man-hour. Chart your course for maximum production with the help of a copy of "Man-Hour Thieves." Write for yours *now* and name of your nearest Towmotor Representative. Towmotor Corporation, Div. 5601, 1226 E. 152nd St., Cleveland 10, Ohio.

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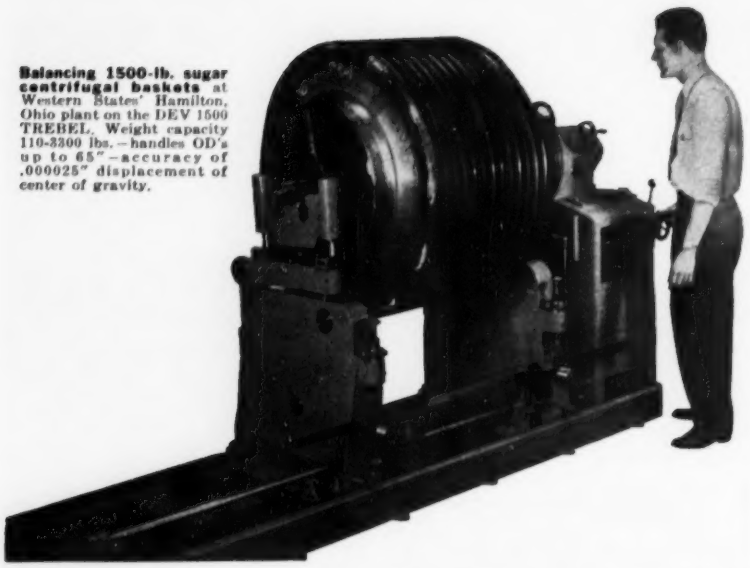

Balancing 1500-lb. sugar centrifugal baskets at Western States' Hamilton, Ohio plant on the DEV 1500 TREBEL. Weight capacity 110-3300 lbs.—handles OD's up to 65"—accuracy of .000025" displacement of center of gravity.

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13 BROWN ST. WATERBURY 20, CONN.

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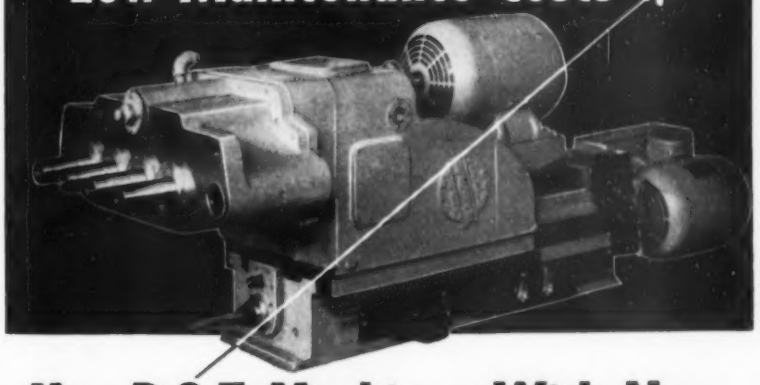

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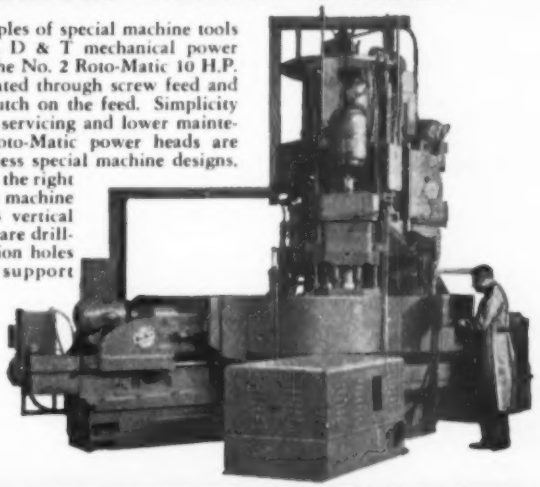

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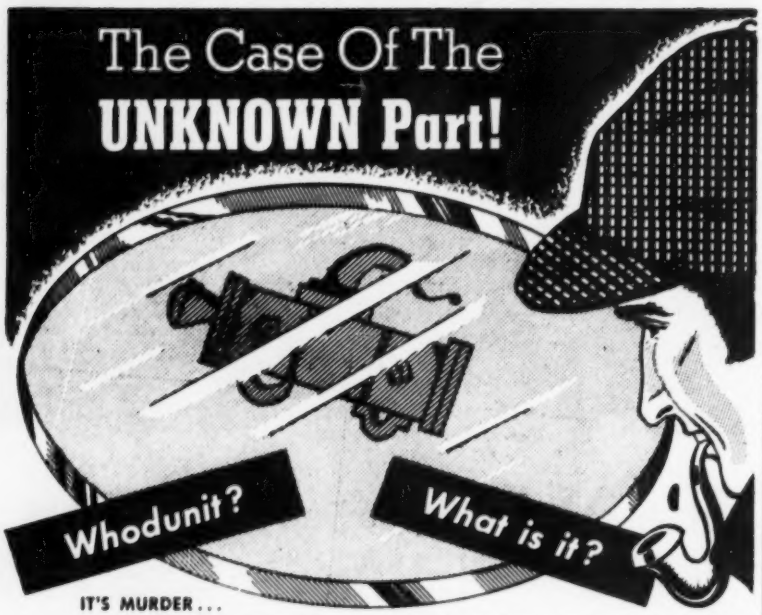

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1810 Belle Plaine Avenue
Chicago 13, Illinois

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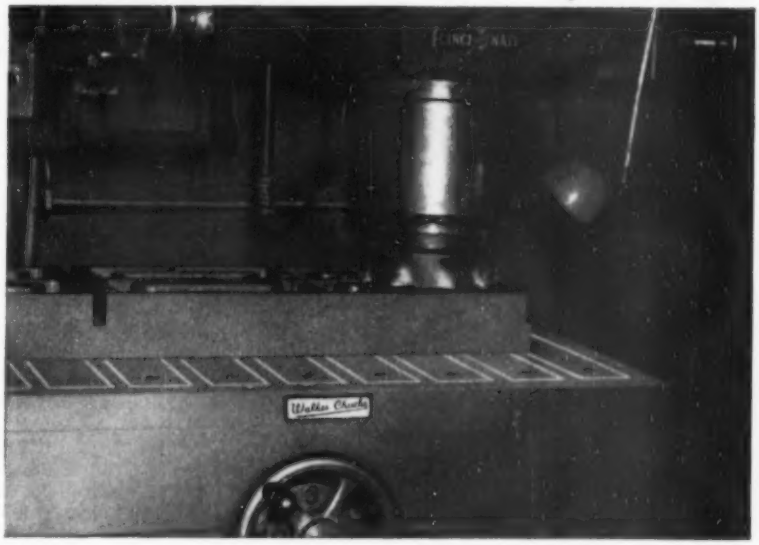
Walker Does It Again—



Milling machine operating a carbide cutter 660 f.p.m.; table feed 25 i.p.m. on rough steel castings. Walker Magnetic Chuck, securely holding workpiece, increases production equivalent to work of four planers. Take advantage of modern Walker methods for increasing production, reducing cost.

O. S. WALKER CO. Inc.

WORCESTER 6, MASSACHUSETTS

Original Designers and Builders of Magnetic Chucks

In Canada—Upton Bradeen & James, Ltd.

for **SMALL JIG BORING**

PUT SMALL JOBS ON THIS **LINLEY MACHINE**

and save your larger machines for heavier work.

YOU'LL BE SURPRISED! **at the extremely low first cost and the vitally important jobs that this little precision machine can do. It will pay you to get our accuracy information on this machine which has 6" x 10" table movement and 7' x 17½" table size.**

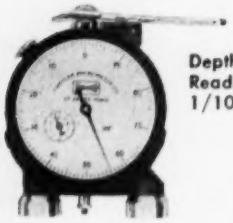
Write TODAY for Full Information

LINLEY BROTHERS COMPANY

664 STATE ST. EXT., BRIDGEPORT 1, CONN.

DIAL FOR ACCURATE

High Speed Inspection



Depth Gage. Readings to 1/1000th.

1" Range Dial Indicator. Adaptable to many tools. Readings to 1/10,000th.

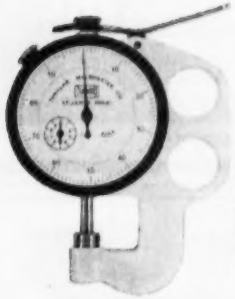
When your production must be held to close tolerances there's a Tumico Dial Indicator gage that will make high speed, accurate inspections. High visibility dials give instant and accurate readings. Our complete and diversified line may provide exactly the right type of dial indicator gage to best speed and insure accurate inspections.

Let our engineers examine your product inspection problem. Write for new catalog showing additional models.

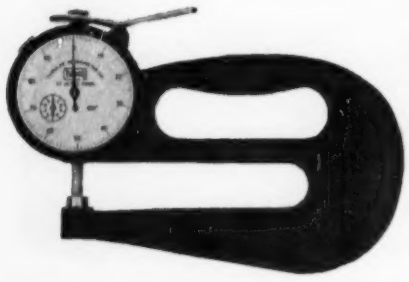
DIAL FOR ACCURATE

High Frequency Checking

1" Range Dial Indicator. Attaches to many tools. Readings to 1/1000th.



Lever Action Hand Thickness Gage with 1" Throat Depth. Readings to 1/1000th.



Lever Action Hand Thickness Gage with 4" Throat Depth. Readings to 1/1000th.

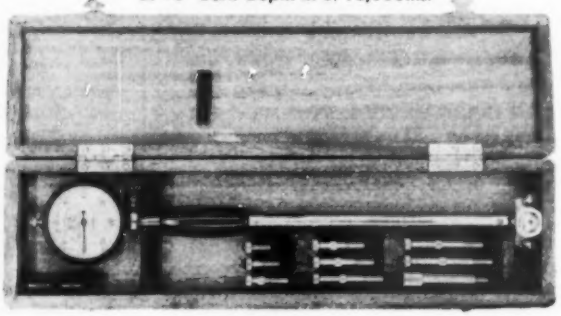
"Quality Control" of production lines can often be improved and speeded up by frequent spot checking with Tumico Dial Indicator hand and bench gages. High visibility assures quick, accurate readings to check vital production points.

Our production engineering department may be able to help you. Write us your problem. Our recommendations and complete catalog showing gages not illustrated will be sent promptly.

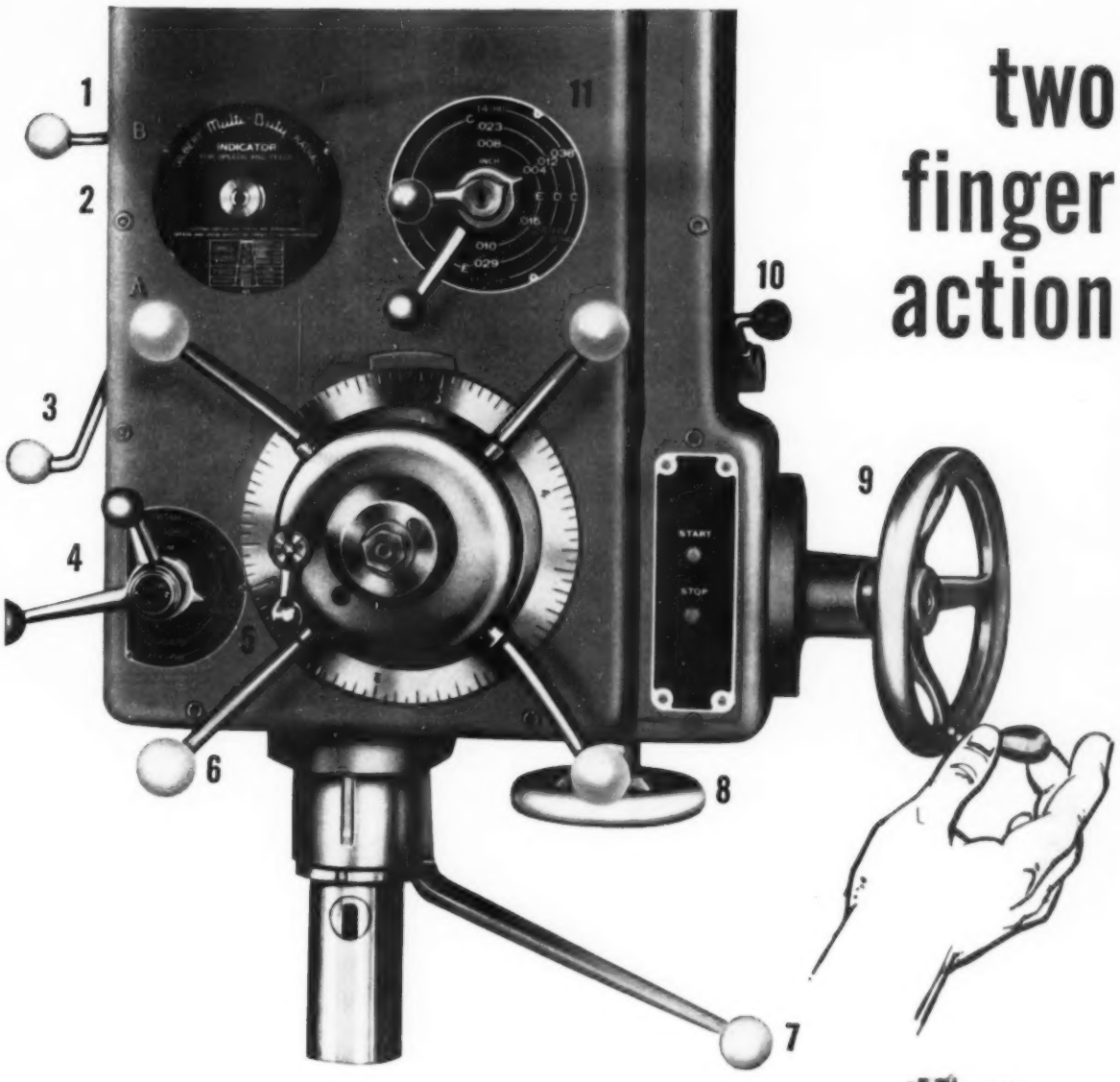
TUMICO DIAL INDICATORS

TUBULAR MICROMETER CO., Box 20, St. James, Minnesota

Dial Bore Depth Gage. Range from 2" to 6" in 10" Bore Depth in 5/10,000ths.

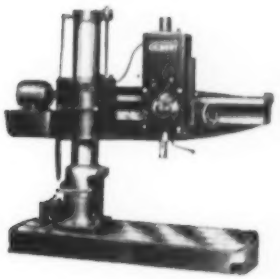


two finger action



Any Gilbert radial operator will tell you that the smooth, easy response of controls saves time, cuts down fatigue, and helps boost output. Furthermore, the operator has good visibility of the work **without** raising the head above a comfortable working height, because the spindle axis is close to the front face of the head.

Note clean, compact grouping of controls: (1) speed back gear, (2) speed and feed indicator, (3) head clamp lever, (4) speed change levers control 12 speeds; direct reading plate simplifies selection. (5) adjustable depth stop clamp, (6) spindle power feed is engaged by pulling any turnstile lever, (7) spindle reverse lever, (8) fine feed hand wheel, (9) head traverse hand wheel, (10) power feed engaging lever, (11) feed change levers provide six feeds (twelve with tap heads) shown on direct reading plate.



Ask your Gilbert representative for a demonstration, or write for Bulletin 349

THE CINCINNATI
GILBERT
MACHINE TOOL COMPANY
3366 BEEKMAN ST. • CINCINNATI 23, OHIO

THOSE WHO BUY GILBERT BUY GILBERT AGAIN

If you make hollow parts, we'll give you the hole

THE center hole's already in Timken® seamless steel tubing. There's less time wasted on machining; you get more parts from each ton of steel you buy because there's less scrap.

Often, finish boring's the first step—screw machine stations can be used for other operations. You get greater machine capacity without adding machines.

Higher quality in your product is assured because the piercing process by which Timken steel tubing is made is essentially a forging operation. The tubing has a uniform spiral grain flow for greater strength and a refined grain structure which brings out the best in the quality of the metal.

And to help you save even *more* steel, the Timken Company's tube engineering service will study your problem and recommend the most economical tube size for your job guaranteed to clean up to your finished dimensions.

For further information on the uses of Timken seamless steel tubing, write The Timken Roller Bearing Company, Canton 6, Ohio. Cable address: "TIMROSCO".

YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH

SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS TUBING